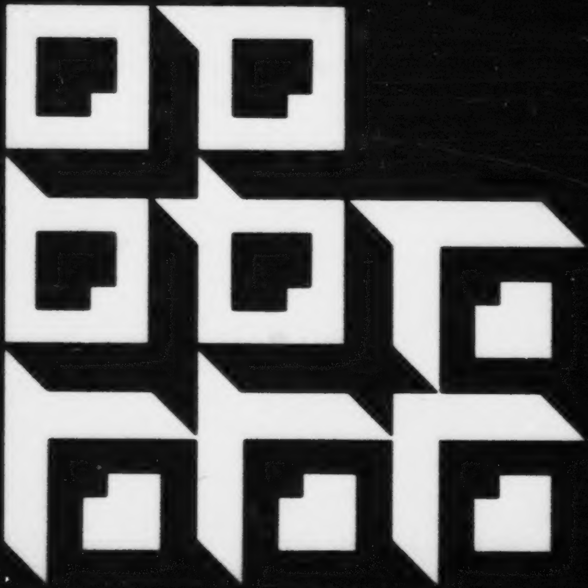
Issues Regarding the Reform of Canada's Private Pensions System

James E. Pesando



Consumer and Corporate Affairs Canada
Consommation et Corporations Canada

En français : *Analyse de la réforme des régimes privés de retraite au Canada*

Disponible au : Service des communications
Consommation et Corporations Canada
Ottawa (Ontario)
K1A 0C9

ISSUES REGARDING THE REFORM OF CANADA'S PRIVATE PENSIONS SYSTEM

James E. Pesando

Professor of Economics
University of Toronto

Policy Research, Analysis and Liaison Directorate
Bureau of Policy Coordination
Consumer and Corporate Affairs Canada

The analysis and conclusions of this study do not
necessarily reflect the views of the Department.

©Minister of Supply and Services Canada 1983
Cat. No. RG23-68/1983E
ISBN 0-662-12164-3

FOREWORD

A number of studies have been commissioned by the Policy Research, Analysis and Liaison Directorate into policy-oriented topics in the fields of consumer finance, credit and financial security. The purpose of widely circulating these studies by publication is to prompt consideration by the general public, government and the academic community, of the consumer interest in the relevant policy issues.

The present study primarily addresses reform of occupational (employer-sponsored) pension plans. However, the relationship between these plans and public (government-sponsored) programs such as the Canada/Quebec Pension Plan is also examined. Additional research is now being undertaken concerning the role of, and government policies affecting, individual retirement planning. This research contributes to the major review of governments of Canada's retirement income system.

It should be recognized that the analysis, conclusions and policy recommendations are those of the author and do not necessarily reflect the views of the department.

Fenton Hay

Dr. Fenton Hay
Director General
Policy Research, Analysis
and Liaison Directorate

SUMMARY

The three elements of Canada's retirement income system are public (government-administered) income programs, occupational (employer-sponsored, public and private sector) pension plans and individual retirement planning (including RRSPs). It is widely recognized that these arrangements have failed to provide adequately for a significant portion of today's elderly. While the roles and attributes of the three elements differ considerably, occupational pension plans have been subject to particularly strong criticism. The theme of this research report is reform of the private sector pension plans. In Part I, the potentials and limits of employer-sponsored (occupational) pension plans are examined. Adaptation to inflation and consequent cost implications are important aspects of the analysis. In Part II, the impact of various considerations on the pension incomes generated by money purchase plans -- an alternative to conventional occupational pension plans -- is assessed.

In Chapter I of Part I, a framework is developed for discussion of the weaknesses of occupational pension plans. The study examines those aspects of traditional pension plans which have been subject to strong criticism. The policy recommendations in this chapter reflect the conclusion that: (1) cost-of-living protection in occupational pension plans constitutes a very fundamental matter which needs to be resolved, and (2) the implications for the funding of the plans should be a basic consideration in defining appropriate policy initiatives in the area of pension reform:

(a) The transfer of accumulated contributions to an RRSP appears to be the appropriate action respecting the accumulated contributions of employees leaving the pension plan prior to retirement (i.e., employees terminating their employment with the plan sponsor). Such provision would alleviate the limitations of these plans in the areas of the vesting and portability of pension credits.

(b) Most occupational pension plans do not contain clauses to adjust benefits to reflect increases in the cost of living. As a result the real purchasing power of the pension income diminishes continuously -- even prior to retirement in many plans. Performance indexing is a means for providing substantial protection against inflation for pension benefits. Under performance indexing, the pension benefits payable are measured according to the ex-

cess of the fund's earnings over a statutory interest rate, in the 2%-3% range, corresponding to the probable inflation-adjusted return obtainable on investments.

(c) Actuarial reduction of the pension benefit at retirement to provide a survivor benefit is a means for ensuring a continuing income for the surviving spouse following the plan member's death.

(d) For some occupational pension plans, there is a significant unfunded liability. In this case, the risk of employer insolvency or plant shutdown impinges on the security of the pension income. This issue merits further attention and possibly policy measures to provide insurance against plan termination.

(e) Although only half of full-time workers in the private sector are covered by occupational pension plans, this situation is not necessarily problematic. Since low-income workers receive high rates of replacement income under income-tested public programs, they would probably prefer not to reduce their current incomes in order to make pension contributions. Further, individuals not covered by occupational pension plans are free to save for their own retirement. RRSPs provide tax incentives to do so.

(f) Expansion of the C/QPP has been proposed as a means for improving Canada's retirement income system. Funding such a program, however, presents a number of serious problems. In addition, the impending reform of occupational plans and disadvantages for low-income households imply that such an expanded C/QPP may not be required.

(g) Full indexation of pension benefits to changes in the cost of living is prevalent in plans for government employees. Private sector plan sponsors are not in a position to provide such guarantees. Accordingly, it may be appropriate to substitute performance indexing in public sector occupational plans.

(h) The issue of mandatory retirement is not primarily a pension issue. However, age of retirement does have significant implications in terms of the funding requirements of private and public sector pension plans.

The traditional occupational pension plans are defined benefit plans. Pensions are flat benefit (simply a certain number of dollars per week, for example) or are based on final earnings or career average earnings. In the absence of cost-of-living adjustments, the purchasing power of pensions determined on such bases would diminish continuously over time. In Chapter II of Part I, the potential for current occupational pension plans to provide indexed pension benefits is assessed on the basis of their actuarial design. Specific aspects of the design that vary by individual plan are the interest rate and salary scale assumptions. The implications of various representative specifications are investigated. The main conclusion is that the interest rates incorporated in the actuarial specification of the plans are such that the plans are simply not capable of providing fully indexed pension benefits. Under the circumstances, the alternatives for achieving cost-of-living protection are to substantially increase contribution rates or significantly scale down pension benefits.

The magnitude of the problem is indicated by the results of the empirical analysis, displayed in Table 3, in terms of the impact of indexation on contribution rates. The incremental cost of indexation is very sensitive to the precise actuarial specification of the plan. In general, the proportionate increase in required contribution rates (in order to permit benefit indexation) is very much higher for flat benefit plans than for plans in which pension income is based upon final or career average earnings.

Mandatory indexing of occupational pension plan benefits has been proposed as a policy for providing cost-of-living protection. The findings in this report imply that mandatory indexing of pension benefits will require the scaling down of benefit formulas for pensions already in pay and for pension credits accumulated prior to this reform. Otherwise the funding of pension plans will not be adequate to pay indexed benefits. For pension credits earned after indexing becomes mandatory, the choice is to scale down the benefit formula or increase contribution rates. The analysis also suggests that the adjustments necessitated by mandatory indexation would vary significantly across plans depending upon their current valuation assumptions.

In Part II, the income replacement capabilities of money purchase pension plans are examined as an alternative to conventional defined benefit plans. The term "money purchase" refers to plans in which the pension income is whatever annuitized income stream can be generated by the contributions which have accumulated in the employee's name. Money purchase pension plans represent an approach which appears capable of remedying many of the shortcomings of traditional defined benefit plans. Since the contributions of individuals accumulate separately and pension benefits are determined explicitly by the resources of the individual's fund, such matters as vesting portability survivor benefits, security of fund and cost-of-living protection are more easily handled.

The focus for the analysis in Part II is the variation in pension incomes resulting from differences in investment portfolio, time period of contributions and career earnings profiles. Since these considerations are also relevant for defined benefit plans, the findings in Part II provide indirect information regarding the degree of uncertainty, in terms of income replacement rates, which could result under performance indexing. RRSPs are a form of money purchase plan and therefore the results are directly relevant to these plans.

The pension incomes resulting from contributions held in various investment portfolios for varying time periods and for different career-earnings profiles are estimated. The analysis is in terms of the income replacement rates where pension contributions are specified as a proportion of employee income. The results of simulations based on historical data suggest that income replacement rates are highly sensitive to the form in which contributions are accumulated. Even for a specific financial asset, the actual replacement rate is quite uncertain. This is particularly the case if contributions are held in the form of common stocks. However, for such long-term investments, the income replacement rate resulting from investment in stocks is likely to be much higher and unlikely to be lower than the replacement income resulting from investment in government bonds. The findings reflect primarily differences in the real rate of return, and the volatility thereof, corresponding to the alternative assets which could constitute the pension investment portfolio. In addition, the results illustrate the sensitivity of the income replacement rate to the career-earnings profile and the length of the contribution period.

TABLE OF CONTENTS

Page

PART I - ASSESSING THE CENTRAL ISSUES IN THE DEBATE SURROUNDING THE ADEQUACY OF OCCUPATIONAL PENSION PLANS 1

Chapter I - OVERVIEW AND CRITICAL ASSESSMENT OF THE CENTRAL ISSUES 3

Introduction 3
  Objectives and issues 3
  Relevance of the economist's "rational man" 4
  Criteria to assess policy initiatives 6
  The previous studies 6

Limitations of Occupational Plans in the Private Sector 8
  Vesting 8
  Cost-of-living protection: postretirement 10
  Cost-of-living protection: preretirement 12
  Portability 14
  Survivorship provisions and the splitting of pension credits 17
  Funding and the security of benefits 18
  Coverage 19

Possible Expansion of the Canada/Quebec Pension Plan 21
Related Issues 23
  Occupational plans in the public versus private sector 23
  Mandatory retirement 25
Policy Recommendations 26

Chapter II - VALUATION ASSUMPTIONS AND THE COSTING OF OCCUPATIONAL PENSION PLANS IN AN INFLATIONARY CLIMATE 33

Analysis of Interest Rate and Salary Scale Assumptions 33
  Introduction 33
  The valuation assumptions 34
Employee Valuation of Pension Claims and Reported Valuation Assumptions 37
The Impact of Mandating Pre- and Postretirement Indexing on Contribution Rates and Unfunded Liabilities 40

Page

The Incidence and Redistributive Aspects of Alternative Indexing Initiatives 46
Employee Valuation of Pension Claims: Related Issues 49
  The security of benefits in underfunded flat benefit plans 49
  Inflation and benefit design in employer-sponsored pension plans 52

Summary 52

Policy Recommendations 54

PART II - UNCERTAINTY REGARDING INCOME REPLACEMENT IN MONEY PURCHASE PENSION PLANS: EVIDENCE AND INTERPRETATION 57

Introduction: The Issues 59
Historical Data on the Real Returns to Alternative Assets 61
The Simulation Experiments: Design 64
The Simulation Experiments: Results 67
Money Purchase versus Defined Benefit Plans and the Role for Public Policy 77
  The exposure of members of defined benefit plans to inflation risk 77
  The transfer of investment risk to employers/ shareholders in defined benefit plans and the role of compensating wage differentials 80
  Ad hoc cost-of-living adjustments financed from excess investment earnings: are defined benefit plans just money purchase plans in disguise? 81

Implications for Public Policy 83

LIST OF TABLES

Page

Table 1 - The Interest Rate Assumption: Plans Supervised by the Pension Commission of Ontario 35

Table 2 - The Interest Rate Assumption: Plans Surveyed by Financial Executives Institute Canada, Fall 1979 35

Table 3 - Interfirm Variation in Valuation Assumptions: Impact on Estimated Costs of Pre- and Post-retirement Indexing 42

Table 4 - Real Rates of Return (Per Cent per Year) on Alternative Assets: 1953-1980 62

Table 5 - Income Replacement Rates Under Alternative Investment Strategies: Simulation Results (25 Trials) 68

Table 6 - Income Replacement Rates: Alternative Contribution Periods 71

Table 7 - Income Replacement Rates Under Alternative Investment Strategies: No Salary Growth 73

Table 8 - Income Replacement Rates with Nominal Interest Rate in Annuity Calculation 73

PART I

ASSESSING THE CENTRAL ISSUES IN THE DEBATE SURROUNDING THE ADEQUACY OF OCCUPATIONAL PENSION PLANS

Chapter I

OVERVIEW AND CRITICAL ASSESSMENT OF THE CENTRAL ISSUES

Introduction

Objectives and issues. The objectives of public policy toward the provision of retirement incomes are twofold: reducing the incidence of poverty among the aged, and facilitating the replacement of income for those Canadians who cease active work and enter their retirement years. The existence of Old Age Security/Guaranteed Income Supplement (OAS/GIS) and various provincial "top-offs," together with the modest replacement rate and earnings ceiling of the Canada/Quebec Pension Plan (C/QPP)(25% of the average industrial wage), combine to make Canada's public pension system look fairly generous -- by international standards -- at low income but not at high income levels. This fact has helped to focus attention on the income replacement objectives of public policy, and hence the perceived limitations of employer-sponsored (occupational) pension plans in the private sector. Chapter I provides an objective assessment not only of these perceived limitations, but also of the policy initiatives that might be directed toward them.

The major catalyst in the present debate regarding the reform of private pension plans is undoubtedly inflation. The indexing of pensions in pay in the private sector is rare, and, in today's inflationary climate, this limitation is perhaps the major concern of those advocating pension reform. Inflation may also reduce the real value of pension benefits even as they accrue during the plan member's active work years, at least in (unamended) flat benefit and career average plans. For the mobile employee, the present situation is further aggravated by inflation. Those employees who are entitled to deferred pensions face the prospect of having their pensions eroded in real terms by inflation which occurs in both the pre- and postretirement period. From a different perspective, plan sponsors can discharge their obligations to terminating, vested employees at high interest rates which contain a substantial inflation premium. This result, in turn, threatens to make illusory any move toward earlier or immediate vesting. Further, as discussed later in the report, inflation and the subsequent (and retroactive) amendments to mitigate its impact contribute to the present underfunding of flat benefit plans. The threat to the security of the benefits so provided, in the event of plant shutdowns, firm insolvency or other events which may lead to the termination of a plan, is becoming increasingly topical.

There are two broad options under active consideration by those concerned with pension reform. The first is to preempt the need for legislated improvements to occupational plans by expanding the C/QPP so that the income replacement objective of public policy is achieved through the earnings-related public pension program. The second is to address these limitations, to shore up the private system so as to improve its delivery of retirement incomes in an inflationary climate. The emphasis in this report is on the second option since: (1) policy initiatives regarding occupational plans are likely even if the C/QPP were to be expanded, and (2) the expansion of the C/QPP does not appear likely at the present time. A major theme of the report is the importance of costing the pension benefit formula against the benchmark of a noninflationary environment so that both the employer and plan members correctly perceive the true cost of the benefit if it is, at least in principle, to be preserved in real terms in both the accrual and the retirement period. This exercise, in turn, provides insight into the type of initiative necessary to improve the delivery of retirement incomes to mobile employees and to improve the security of benefits in underfunded flat benefit plans.

Relevance of the economist's "rational man." Those concerned with pension reform tend to take as given and as unquestioned the need to improve through public initiative the delivery of retirement incomes by occupational pension plans. On the other hand, if rational workers have complete information regarding the valuation of pension benefits, and if labour markets are competitive, then existing pension arrangements -- no matter how flawed they may appear to those who advocate reform -- must be efficient. The disparity in these viewpoints merits elaboration.

Consider, for example, the proposal that vesting (the time at which an employee becomes legally entitled to a benefit under the terms of the plan) be made full and immediate. The proposal is motivated by the fact that, at present, the mobile employee may forfeit his deferred wages if he fails to meet the age and/or service requirements of existing vesting rules. In the rational man paradigm of mainstream economic analysis, delayed vesting is regarded as but one dimension of the employment contract which represents the efficient solution to a market problem. If delayed vesting is outlawed, then employers would be forced to adopt alternative devices to reduce labour turnover and to retain skilled workers. Steeper wage grids with respect to years of service, for example, could serve this purpose and thus impose analogous costs on the mobile worker. Further, deferred vesting may be an efficient means by which the employer assumes the initial cost of upgrading the skills of the worker. In its absence, the worker may be forced to assume these costs in the form of lower starting wages, and the net result might be a reduction in investment in human capital.

Those concerned with pension reform reject, usually implicitly, the rational man paradigm. In the context of the vesting debate, workers may be assumed either unwilling or unable to assess the cost of forfeited pension benefits. Even if employees are assumed capable of assessing these costs, policy-makers might argue that workers should be required to earmark a portion of their lifetime earnings to provide for their consumption needs during retirement. Policy-makers may also draw attention to the fact that delayed vesting can result in the loss of pension benefits for workers who are involuntarily terminated through plant shutdowns, firm insolvency and so forth. This argument would be nullified, however, if steeper wage grids with respect to years of service were used by employers to reduce labour turnover in the event that delayed vesting provisions were outlawed.

As emphasized in Chapter II, employee valuation of pension claims is a complicated issue. There are many who would argue on this basis alone that the rational man paradigm is severely compromised. Many young employees, for example, belong voluntarily to contributory, defined benefit plans in which the value of their own contributions is more than sufficient to purchase their accruing benefits. Many employers have erroneously argued that the Canadian economy cannot afford indexed pensions, a result which may have slowed the search for options which would provide improved cost-of-living protection. There is a reasonably persuasive argument that many employers and their workers have not understood how pension plans must be costed if the contribution rates so determined are to be sufficient, at least in principle, to provide indexed benefits.

Even if rejected, the rational man paradigm focuses attention on the need for policy-makers to justify the basis for their proposed initiatives. If action is contemplated on the assumption of incomplete information on the part of workers regarding the value of their pension benefits, then the possibility of improving the flow of such information merits attention. If action is contemplated on the assumption that workers have complete information, then the outright paternalism -- and the likelihood that individuals' preferences are deliberately being overridden -- merits note.[1] Finally, and perhaps most importantly, the rational man paradigm can help identify the economic adjustments likely to accompany a policy initiative, which may be a pivotal factor in the decision as to whether the contemplated initiative ought to be implemented.

Criteria to assess policy initiatives. Subject to the qualifications noted above, the consensus view is that policy initiatives designed to improve the delivery of retirement incomes by occupational pension plans are required. The preceding discussion suggests that three criteria be applied to any proposed policy initiative. First, it must improve the ability of occupational plans to deliver retirement incomes per se. Second, in the absence of explicit objectives to the contrary, it should be designed to have minimal income redistributive effects. The creation of windfall gains or losses is to be avoided. Third, its impact on the efficiency of private contracts should be minimized. As an implication, this final criterion recognizes the likelihood of an endogenous response by market forces to policy initiatives.

The previous studies. Major studies of the retirement income system in Canada have recently been completed by the federal government's Task Force on Retirement Income Policy (Task Force),[2] the Economic Council of Canada (Council),[3] the Special Senate Committee on Retirement Age Policies (Senate Committee)[4] and the Royal Commission on the Status of Pensions in Ontario.[5]

---

[1] In the discussion of the income-replacement objectives of the C/QPP, the Task Force on Retirement Income Policy notes (The Retirement Income System in Canada: Problems and Alternative Policies for Reform [Hull, Que.: Supply and Services Canada, 1980], Summary, p. 27): "the assumption is made here that a large proportion of Canadians would, if given the choice, choose to arrange their lifetime consumption so that they would be roughly as well off after retirement as they were before." The crucial phrase "if given the choice" suggests that in the absence of a forced savings scheme such as the C/QPP, Canadians would not be able to allocate their lifetime incomes so as to achieve the desired degree of consumption stabilization.

[2] Ibid., 2 vols. and Summary.

[3] Economic Council of Canada, One in Three: Pensions for Canadians to 2030 (Hull, Que.: Supply and Services Canada, 1979).

The Task Force's study provides a detailed analysis of the limitations of occupational pension plans, especially those in the private sector, and surveys the issues involved in the possible expansion of the C/QPP. The Task Force makes no specific recommendations but sets out four basic options for the reform of earnings-related plans. These are: (1) strengthen occupational plans by a set of mandated reforms; (2) encourage the gradual elimination of defined benefit plans and their replacement by defined contribution plans; (3) mandate occupational plans subject to minimum benefit requirements; and (4) enlarge the C/QPP with or without provisions whereby employers offering comparable benefits might contract out of the enlarged segment. The theme of the Task Force's analysis is that reform of the retirement income system is urgent and that attention must now focus on alternative reform initiatives.

The Council pays particular attention to the impact of demographic developments on the contribution rates necessary to meet the obligations due under the C/QPP and OAS/GIS together with the impact of these public programs on aggregate saving and capital formation. Limitations of occupational plans, particularly in an inflationary setting, are noted. The policy recommendations, which are somewhat divorced from the main body of analysis, favour the improvement of occupational plans rather than the expansion of the C/QPP as a means of achieving retirement goals with respect to income replacement.

Although charged with the initial task of examining the existing policies that affect retirement age, the Senate Committee found it necessary to address the more general issue of the adequacy of retirement incomes. The Committee argues that the most difficult problems faced by occupational plans are those posed by inflation and concludes, perhaps prematurely, that "the possibility of improving and extending the private pension plan system in an inflationary climate seems remote."[6] Noting that the C/QPP preserves the real value of pension credits in both the pre- and postretirement periods, and that coverage under the C/QPP is virtually complete, the Committee recommends that both the benefits and contribution rates to these plans be sharply increased. Although the Senate Committee conducted little original research, its policy prescriptions are representative of those who argue that an enlarged role for the government is necessary to improve the delivery of retirement incomes.

---

[4] Special Senate Committee on Retirement Age Policies, Report: Retirement Without Tears (Hull, Que.: Supply and Services Canada, 1979).

[5] Royal Commission on the Status of Pensions in Ontario, Report (Toronto: Government of Ontario, 1981).

[6] Senate Committee, Report, p. 7.

Limitations of Occupational Plans in the Private Sector

Vesting. At present, most provincial Pension Benefits Acts require that an employee's benefits must vest after he has reached age 45 and completed ten years of service. If an employee leaves a plan before his benefits vest, then he typically receives only the return of his own contributions, usually with interest. In a noncontributory plan, he receives nothing. Many plans have more liberal vesting provisions than the statutory "45 and 10" rule.[7] Nonetheless, about 75% of members of occupational plans are in plans that require at least ten years of service before their benefits vest. As a result, mobile employees may enter retirement with few, if any, years of pensionable service and thus draw minimal, if any, income from occupational pension plans.

The nearly universal recommendation is that minimum vesting provisions be relaxed. Saskatchewan, for example, has recently proposed an amendment to its Pension Benefits Act which would require (at a minimum) that an employee's benefits vest when age plus years of service equal 45. As noted in the beginning of this chapter, the move toward earlier or immediate vesting will probably lead employers to adopt alternative incentives, such as wage grids which are more steeply graded with respect to years of service, to reduce turnover and to retain skilled employees. On balance, and in part due to the discontinuity of present vesting rules (i.e., an employee has 100% vesting or none at all), the recommendation that minimum vesting rules be relaxed appears sound. The issue, in principle, becomes that of weighing the administrative costs of, say, immediate versus slightly delayed vesting against the advantage of the former in enhancing the delivery of retirement incomes. The logic of introducing a more relaxed vesting standard to improve

---

7. Details of vesting provisions in force in Canada, together with an international perspective which shows that minimum vesting provisions in Canada involve more delay than in most countries, are presented by the Task Force.

the delivery of retirement incomes per se suggests that the vested benefits of the terminating worker be locked in. The worker should not have the option of receiving the cash equivalent of the benefit due him under the terms of the plan.

A major issue regarding the reform of statutory vesting rules is the extent to which the benefits so conferred, in the absence of complementary initiatives, might be illusory. The advantage of immediate vesting for the young employee in a contributory, defined benefit plan is likely to be negligible in the absence of such parallel initiatives. The contributions made by the young employee are likely to be sufficient to purchase all of the accruing benefits to which he becomes entitled. This result is due to the fact that the employer's liability in a contributory, defined benefit plan is limited to the difference between the accumulated value of the worker's own contributions and the capital sum necessary to purchase the deferred annuity promised under the terms of the plan. Particularly when nominal or market interest rates are high, this capital sum is likely to be low and hence the employer's liability is likely to be small or nonexistent. The awkwardness of this situation is evident in the rather complicated scheme that accompanies Saskatchewan's proposed move toward earlier vesting. The proposed legislation stipulates that the worker's own contributions may be applied to purchase not more than one half of the capital sum necessary to acquire the deferred annuity. If his contributions can purchase more than 50% of the benefit, then the excess may be transferred by him to a (perhaps locked-in) Registered Retirement Savings Plan (RRSP). Without this additional requirement, the proposed move to vesting when the employee's age plus years of service equals 45 would confer little or no benefit to young employees in contributory, defined benefit plans. In passing, it should be noted that 99% of members of occupational pension plans in the public sector are in contributory plans.[8] The corresponding figure for the private sector is 50%. Further, the vast majority (93.6% in 1978) of members of occupational plans are in defined benefit plans.

In short, the move to more rapid and immediate vesting is likely to confer little or no gains to young employees (except those in defined contribution plans) without complementary legislation akin to that proposed by Saskatchewan. An attractive option that merits consideration is the requirement that the deferred annuity to which the terminated employee becomes entitled be valued on the basis of a real interest rate. This requirement would establish a fund which, at least in principle, would be sufficient to preserve the real value of the deferred annuity, both pre- and postretirement. In so doing, it would also be a major step toward improving the effective portability of pension benefits. The use of a real interest rate to value the deferred annuity due terminated employees, and presumably current annuities as well, would raise plan costs and thus increase required contribution rates. This aspect of the adjunct reform receives careful attention in Chapter II of this report.

---

[8] See Statistics Canada, Pension Plans in Canada 1978, cat. no. 74-401 (Ottawa: Supply and Services Canada, 1979), p. 23.

Cost-of-living protection: postretirement. The full and contractual indexing of pensions in force is very rare in the private sector. This fact implies that the real value of such benefits is likely to be eroded, perhaps severely, by inflation which occurs during the plan member's retirement years. This fact also draws attention to the rather sharp contrast between occupational plans in the public sector, where indexing is prevalent, and those in the private sector. Plan sponsors in the private sector have frequently made cost-of-living adjustments to offset in part the impact of inflation. There is little reason, however, to challenge the Task Force's conclusion that such adjustments have on average offset less than one half of the erosion in the real value of pensions in pay caused by inflation.

There is an emerging consensus that this major limitation of occupational plans in the private sector -- the lack of a formalized means of providing cost-of-living protection for pensions in pay -- must be rectified. The attitude of the business community and interested professional groups, although not yet unanimous, has become dramatically more sympathetic to this need during the past five years. The crucial issue now faced by plan sponsors and policymakers alike is how to transform the macroeconomic truth that indexed pensions only preserve pensioners' claims on real output into a practical scheme whereby individual plans can provide improved cost-of-living protection. Two basic approaches to preserving the real value of pensions in pay are receiving the most attention.[9] The first is to exploit the federal government's ability to underwrite inflation risk -- by having the government issue index bonds, sell price-indexed annuities, stabilize real returns or provide inflation insurance -- in order to enable plan sponsors to provide full and contractual indexing. The second is to require plan sponsors to apply excess investment earnings above a statutory real interest rate to escalating pensions in pay, a technique known as performance indexing. The advantage of performance indexing is that no further government involvement is required; the disadvantage, that full offset of the impact of inflation is not guaranteed.

---

[9] Both schemes, including possible variants, are discussed in detail in Task Force, Retirement Income System, vol. I, pp. 225-37. See also the discussion of an inflation insurance scheme and related issues in Council, One in Three, pp. 83-84.

The crucial question is the extent to which performance indexing is likely in practice to approximate full cost-of-living protection. The simulations performed by the Task Force illustrate the likely success of performance indexing.[10] On the assumption that the plan's assets are fully invested in a 90-day commercial paper which produces a real return of 2%, the data indicate that the use of excess earnings (in this case, in excess of 2%) would have been sufficient to offset virtually all of the impact of inflation during the period 1962-1978. Using a 2% return with the plan's assets fully invested in long-term bonds, the real value of the pension in 1978, 16 years after its commencement, would have been 83% of its original value. If the pension had not been indexed, its real value would have fallen to 43% of its initial value. Significantly, these simulation results were obtained for a period of almost secularly rising inflation. Since the real returns provided by fixed-income investments are likely to be low in such periods, the simulation results indicate the probable success of performance indexing even under the most adverse of circumstances.

A conservative estimate of the real return on a diversified portfolio of fixed-income securities would be 2% to 3%. Historical data suggest that a figure of 3% to 4% would be appropriate if equities were included in the plan's portfolio. These figures suggest that a real return assumption at 3%, or at most 4%, would be appropriate if a performance indexing scheme were introduced with the explicit goal of approximating full cost-of-living protection.

There are, however, a large number of unanswered questions regarding the mechanics of a performance indexing scheme. These include: the use of a benchmark as opposed to the plan sponsor's own portfolio to define excess investment earnings; the choice of the real interest rate; the use of the total income from the portfolio or just that from the fixed-income portion to define excess earnings; and the mechanism by which surpluses (if excess earnings exceed the amount necessary to fully offset the impact of inflation) -- and perhaps deficits (if the actual investment earnings are in fact less than the real interest rate) -- are to be banked for the future. Three criteria are relevant to the ultimate design. First, the scheme must be designed so as to provide on an a priori basis a high degree of inflation protection. Second, the incentive for the plan sponsor to achieve a favourable investment return must remain as intact as possible. Third, any distorting or disruptive impact on the capital market emanating from revised investment incentives to sponsors, which could alter portfolio composition objectives, should be minimized. In general, the analysis of performance indexing mirrors that of many of the policy initiatives proposed by the Task Force, the Council and other groups. The concept has received considerable attention, but the practical issues surrounding its implementation have not. The most important issue, the impact on plan costs (and thus benefit design) of mandating either contractual or performance indexing, continues to receive too little attention. An attempt to rectify this situation is contained in Chapter II.

---

[10] Task Force, Retirement Income System, vol. I; see, especially, Table IX-2, p. 230.

Finally, the fact that performance indexing may simply restructure the stream of pension payments without altering their present value merits note. This would be the case, for example, if the introduction of mandatory indexing were accompanied by a scaling down of the basic pension benefit. Employees would have low start, escalating pensions rather than high start, nonescalating pensions. Since this option is one which they presumably have today, but on the whole have not elected to exercise, the question arises as to why the present pattern is implicitly preferred. Individuals' attitudes towards mortality risk and its ramifications, together with possible adverse tax consequences of escalating versus nonescalating payments, merit investigation.

Cost-of-living protection: preretirement. There are two adjustments for inflation which are required if the real value of pension benefits is to be preserved in the preretirement period. The first pertains to the earnings base. It is widely recognized that a final earnings plan succeeds in preserving the real value of an employee's pension credits as they accrue during his active work years because of the tendency of wages to rise in line with inflation. The second pertains to the updating of deferred pensions in order to prevent their erosion in real terms by inflation which occurs prior to the employee's retirement. The issue of updating deferred pensions is an integral part of the problem posed for the mobile employee under present arrangements, and its discussion is appropriately postponed to the discussion of the portability of pension credits.

Data compiled by Statistics Canada indicate that final earnings plans are both far from universal and still concentrated in the public sector.[11] In 1978, 95.3% of members in public sector plans were in plans of the final earnings variety, compared to 29.8% of members in private sector plans. Career average and flat benefit plans thus constitute the majority, by membership, of defined benefit plans in the private sector.

In fact, the likely erosion of the real value of benefits during the preretirement period is not so great as the raw statistics on the incidence of final earnings versus career average and flat benefit plans might at first suggest. In flat benefit plans, which are typically renegotiated in formal collective bargaining, the mean benefit rate (the monthly pension for each year of credited service) rose from $4.28 in 1970 to $10.56 in 1978.[12] This gain of almost 150% exceeds the 80% increase in the consumer price index during this same period. Since such increases typically are applied to past as well as to future service credits, these figures indicate that real pension credits have in fact risen. Data do not permit a corresponding calculation for career average plans, although the frequency of improvements to accrued pension credits during active service is a well documented fact.

Policy-makers may decide that the informal, retroactive improvements to offset the impact of inflation which frequently occur in career average plans should be formalized. This concern is less immediate for flat benefit plans, since the terms of these plans are periodically revised through formal collective bargaining. On balance, as implied by the previous discussion, the need for policy initiatives is easily overstated. The strongest argument for action may be that of parallelism if initiatives, such as requiring that deferred annuities be costed at a real interest rate, are undertaken to preserve the real value of the pension benefits of terminated, vested employees. If sponsors of career average and flat benefit plans are required to use real interest rates to value their plans, as discussed at length in Chapter II, they would in effect be forced to prefund the retroactive, nominal benefit improvements that now occur. The major advantage of this initiative may be to improve the degree of funding -- and hence the security of benefits -- in flat benefit plans (especially), rather than improving upon the present arrangements for preserving the real value of accruing benefits during the preretirement period.

---

[11] Statistics Canada, Pension Plans in Canada 1978, p. 34.

[12] Calculated by the author from data compiled in Statistics Canada, Pension Plans in Canada 1978, p. 35.

A final observation merits note. The Task Force, as part of its concern that there be a "fair" relationship between contributions and benefits for each plan member, suggests that final earnings (or best average) plans be actively discouraged. This recommendation may seem somewhat paradoxical in view of the fact that the final earnings formula does preserve the real value of accruing benefits in the preretirement years. The recommendation reflects the Task Force's concern that those employees with steep earnings profiles enjoy a much higher ratio of benefits to contributions under the terms of such plans than do those with flat earnings profiles. In the opinion of the present author, this concern -- and certain of the policy recommendations that stem from it -- is overstated. This concern is unfounded so long as employers correctly assess the implications for pension benefit accruals of the wage or salary increase paid to a member of a final earnings plan. The existence of the final earnings plan implies that the rise in total compensation will exceed the rate of increase in the worker's wage or salary. So long as this result is correctly factored into the wage offer, there is no reason -- on economic grounds -- to be concerned with the "fairness" issue.

Portability. An employee has a portable pension if the pension credits earned with a prior employer are transferable to the plan offered by a new employer. Pension credits earned under the terms of the C/QPP are portable, while -- with some exceptions -- pension credits in occupational plans are not. Those concerned with pension reform note that if mobile workers are to derive any substantial retirement income from occupational pension plans, then progress on this front is imperative. Earlier vesting is a necessary, but not sufficient, requirement if the situation of the mobile employee is to be improved. At present, the deferred annuity that a terminating (vested) employee receives is likely to be seriously eroded by inflation which occurs during both the active work and retirement years. If the multiplicity of benefit formulas were to make the design of a truly portable pension benefit impossible, then at the very least the updating of deferred pensions is required. Significantly, the ad hoc increases now frequently provided by employers to pensions in force are not extended to deferred pensions. Quite simply, employers are not concerned with the well-being of terminated active workers.

The Task Force recommends that one of two schemes be adopted to update deferred pensions, depending upon the benefit formula. For a final or best average earnings plan, the Task Force recommends that the deferred pension earned by a terminating plan member be revalued between the termination date and normal pensionable age by an appropriate wage and salary index. For all other defined benefit plans, the vested benefits are to be updated by an amount not less than the amount by which the benefits would have been updated had the employee remained at the same job. The latter attempts to gain for terminated employees the same benefit provided active members by the periodic amendments that are typically made to career average and flat benefit plans. This latter proposal in particular is not likely to prove workable, and both are likely to be resisted -- with some justification -- by employers.

Assume that labour markets are perfectly competitive and hence that workers must receive in each period total compensation equal to the market value of their labour services. If, as part of an increase in total compensation paid to active workers, the employer enriched the pension benefit formula, he would be required to make additional payments on behalf of terminated, vested employees. There is no incentive for active workers to make wage concessions to offset these additional payments. Employers would thus have a strong incentive not to enrich pension benefit formulas, but to increase the compensation paid to active workers only by increasing their current wages. If the purpose of the initiative is to extend to terminated employees the improved pension benefits accorded active employees, it will fail. Indeed, by actively discouraging employers from enriching their benefit formulas, it will counter the intent of proposed pension reform since it will work to reduce the delivery of retirement incomes by occupational plans. If the wage and salary index used to update the vested benefits of members of final earnings plans is an economy-wide index, as suggested by the Task Force, the analogous disincentive is removed. The difficulty with this proposal is that it fails to recognize that real wages across firms do -- and should continue to -- vary in response to market forces. For those industries in which market conditions dictate below average increases in real wages, perhaps for extended periods, the prospect of requiring the employer to provide, in effect, larger increases in pension benefits for terminated than for active employees is difficult to justify.

There is an alternative means by which -- at least in principle -- deferred pensions could be insulated from inflation and which could, if required, be extended to provide for real increases in these vested benefits. The proposal stems again from the recognition that if sufficient funds are to be set aside to preserve a pension benefit in real terms, the appropriate benchmark is that of a noninflationary economy. Quite simply, sponsors of defined benefit plans would be required to cost the deferred annuities payable under the terms of their plans on the basis of a real interest rate. To the extent that prevailing market rates are higher by virtue of their incorporation of an inflation premium, the capital sum implied by the real rate will be more than that required to buy a fixed-dollar deferred annuity. The surplus, in effect, is to provide the amount necessary to offset the eroding impact on the real value of the pension implied by the expected rate of inflation (as reflected in the market interest rate) at the time the deferred annuity is purchased. The transfer of the present value of the deferred annuity, calculated at a real rate, to a locked-in RRSP would preserve, at least in principle, the real value of the benefit during both the employee's active work and his retirement years. The result parallels the use of performance indexing as a means of providing cost-of-living protection for pensions in pay. As before, performance could be replaced by contractual indexing if the federal government were to adopt one of the procedures cited earlier for assuming the attendant inflation risk. Given the emerging consensus that performance indexing may be the minimum step required to preserve the real value of pensions in pay, this is logically the minimum step necessary to provide analogous protection for deferred pensions.

If it were thought appropriate to provide, at least in principle, for the real value of the deferred pensions to be updated over time, a simple variant of the above proposal would accomplish this objective without creating the disincentive effects discussed previously. Suppose that the real interest rate employed to capitalize the defined benefit is 3%. If one wanted to provide the terminating employee with sufficient funds so that the real value of his deferred pension could be increased, this could be accomplished by simply lowering this discount rate. If the rate were lowered to 2% (which would then raise the capital sum necessary to pay for the defined benefit), then, in principle, the real value of the deferred pension could rise at 1% a year during both the employee's active work and retirement years. If the 2% rate were applied only to the period between the date of termination and normal retirement age, but the 3% used to calculate the value of the annuity itself, then the capital sum would be sufficient to permit the real value of the deferred pension to rise by 1% per year through the date of retirement and to remain constant in real terms thereafter. Again, the "in principle" caveat is in order since the improvement is analogous to that of performance rather than contractual indexing. Since parallel reforms call for pensions in pay to be price indexed only, the second variant above is the logical form of implementing this alternative updating scheme. Like the updating of deferred pensions in line with an economy-wide wage or salary index, this scheme could result in those with deferred pensions receiving larger real increases than do active plan members. The result is somewhat less visible, and the quid pro quo is that those with deferred annuities remain subject to the investment risks that accompany performance indexing.

Finally, the use of a statutory real interest rate to cost deferred annuities payable under the terms of defined benefit plans could be the centerpiece of a scheme to provide fully portable pension credits. Since the accrued benefits of the terminated employee are all that is relevant, no salary scale is required to calculate the lump sum payment necessary to purchase the deferred annuity. The problem of providing portable benefits then reduces, as a first approximation, to calculating the number of years of pensionable service that this lump sum can purchase, given the age of the employee, under the terms of the plan provided by the new employer. Since not all employers offer pension plans, the option of transferring the capital sum necessary to purchase the deferred pension to a locked-in RRSP must remain available.

Survivorship provisions and the splitting of pension credits. The fact that women constitute a very high percentage of the poor among the current elderly has been a major concern of those advocating pension reform. Programs directed toward the goal of alleviating the incidence of poverty among the aged, such as an increase in the GIS targeted toward singles who live in unsubsidized rental housing, will be the most effective in improving the circumstances of the current elderly poor. One proposed reform plan which would, over time, improve the situation of elderly women in particular is to require occupational plans to provide a standard survivorship benefit.

If mandatory survivorship provisions are introduced, they could have one of two forms. Either the retiring, married employee could be required to take an appropriate actuarial reduction in the pension benefit, or the survivorship provision could be automatic in the sense that no such actuarial reduction would be required. Under the first option, there would be no income redistributive effects between single and married employees. Under the second, married employees would benefit at the expense of single employees. The first option could be introduced retroactively. If the second option were introduced retroactively, there would be an additional redistributive effect in favour of old employees at the expense of young employees. This effect would occur because the higher contribution rate necessitated by the improved benefit is paid, either directly or indirectly in the form of current wage concessions, for only a short time by those at or near retirement age.

There is a strong argument on income redistributive grounds for preferring the first option: married employees should be required to take an actuarially reduced pension. The dramatic increase in the participation rates for women, and the relative affluence of two-income versus single-income households, raises the question of whether the adoption of the second option might also redistribute income from lower- to higher-income households. Both working spouses would, in this case, have unadjusted pensions with a survivorship provision. In this context, it is useful to note the Council's projection that the proportion of women aged 65 and over who will not be beneficiaries of a retirement (as opposed to a survivor's) pension under the C/QPP will fall from 68% in 1981 to 12% by the year 2031.[13] The amendment proposed by the Government of Saskatchewan to its Pension Benefits Act would require that plans provide for at least a 50% surviving spouse benefit with a corresponding actuarial reduction in the benefit of the retiring, married employee. (The proposed amendment, in addition, allows the spouse to waive his or her right to this survivor's benefit so that the retiring employee may receive an unreduced pension.)

Funding and the security of benefits. The degree of funding in occupational pension plans in the private sector, and ultimately the security of the benefits so promised, has received relatively little attention. The Task Force acknowledges the fact that large unfunded liabilities are prevalent in flat benefit plans and recommends that accelerated funding be required for those plans with large unfunded liabilities.

The issue of the security of benefits in flat benefit plans in particular is discussed at length in Chapter II in conjunction with the recommendation that plans be required to value both accruing benefits and annuities payable under the terms of the plan on the basis of a real interest rate, as would occur in a noninflationary climate. Still, a number of observations merit note at this time.

---

[13] Council, One in Three, p. 108.

First, the absence -- through firm insolvency or major plant shutdowns -- of a well-publicized plan termination in which employees fail to receive the full value of their vested benefits has, until very recently, placed this issue "on the back burner." Since plan provisions typically limit the employer's obligation to the lesser of vested or funded benefits, the above situation could well occur if an underfunded flat benefit plan were terminated. Second, although none of the earlier studies advocated the introduction of plan termination insurance, recent plant shutdowns in Ontario have produced political pressure to provide such insurance. Because of subtleties surrounding employee valuation of pension claims, including the possibility that employees discount the value of unfunded benefit improvements by granting ceteris paribus smaller wage concessions than for funded benefit improvements, the economic case for introducing retroactive termination insurance is not firmly established. Such insurance could arbitrarily redistribute wealth from shareholders to employees with past service credits if: (1) employees had previously discounted the value of poorly funded pension benefits, and (2) competitive pressures ensure that workers always receive the full value of their current labour services. In general, the desirability of introducing termination insurance is not clear and the issue merits careful study. Third, as discussed in Chapter II, requiring that sponsors use a real interest rate to cost their plans would in effect ensure that the retroactive, nominal benefit improvements in flat benefit plans would be prefunded. This policy initiative would reduce the need for plan termination insurance and might prove to be a satisfactory means of enhancing the security of promised benefits.

Coverage. Data compiled by Statistics Canada indicate that in 1976 only about 50% of paid, full-time workers in the private sector between the ages of 25 and 64 were members of occupational pension plans.[14] Coverage in the public sector, by contrast, was virtually 100%. Within the private sector, certain systematic patterns exist. Coverage ratios are much below average in the wholesale and retail trades, the service sector and in agriculture. Almost all large employers in the private sector offer pension plans while many smaller firms do not. Of particular relevance is the apparent fact, distilled by the Task Force on the basis of income tax records, that those whose employment earnings are low are less likely to be members of occupational pension plans. Both the Task Force and the Council draw attention to the fact that, because of their relative concentration in those industries (such as retail trade) where coverage is low, the percentage of women who are members of occupational plans is less than the percentage of men. The Task Force estimates that somewhat less than 60% of men aged 25 to 64 who are paid workers in the private sector belong to occupational pension plans, compared to 33% of women.[15]

---

[14] Statistics Canada, Pension Plans in Canada 1976, cat. no. 74-401 (Ottawa: Supply and Services Canada, 1978), p. 15.

Clearly, proposed reforms of occupational plans will do nothing to improve the situation of those who are not members of such plans. The Council does not recommend, however, that coverage be made mandatory. Instead, the Council urges that "a co-ordinated plan be established by the federal and provincial governments to encourage and induce the extension and improvement of occupational pension plans."[16] The third (mandating occupational plans subject to minimum benefit standards) and fourth (enlarging the C/QPP) options analyzed by the Task Force, by contrast, would effectively improve pension coverage.

Mandated improvement in pension coverage might, in fact, confer relatively little benefit on those affected. Note first that if employers are required to offer plans, the incidence of employer contributions will, according to received economic theory, fall ultimately on the employee.[17] Workers, including many at the lower income levels, will thus be required to allocate a larger fraction of their lifetime earnings to provide for consumption during their retirement years. On the other hand, this initiative will gradually reduce over time the likelihood of future claims on income-tested programs such as GIS and the various provincial "top-offs." On the other, by forcing low-income individuals to provide ceteris paribus a larger share of their own retirement incomes, this initiative may redistribute income away from those with low lifetime earnings. This could lead to pressure for tax credits or other government assistance to ease the burden of the proposed reform on low-income workers. Legislating mandatory coverage (with employer contributions) would also be equivalent to increasing the minimum wage since the incidence of employer contributions could not be shifted to the workers so affected. The traditional analysis of the impact of increasing the minimum wage, including the prediction that at least some low-paying jobs would disappear, would be relevant.

---

[15] Task Force, Retirement Income System, vol. I, p. 43.

[16] Council, One in Three, p. 104.

[17] This result is noted by the Task Force (Retirement Income System, p. 165) in its discussion of the costs of alternative pension reforms, although the casual reader could easily lose sight of this important acknowledgement.

Employees who are not members of occupational plans have the option of contributing to RRSPs. To the extent that low-income Canadians choose not to contribute to RRSPs, their revealed preference for current consumption is clear. (Given the low value to them of the tax subsidy associated with RRSP contributions, together with the likelihood that they would be substituting their own saving for retirement for benefits otherwise available from income-tested public programs, this decision is probably rational.) For other workers who are not members of occupational plans, the fact that they can contribute to RRSPs if they so choose merits emphasis.

Possible Expansion of the Canada/Quebec Pension Plan

Coverage under the C/QPP is universal, vesting is full and immediate, pension credits are fully portable and pensions in pay are fully indexed to inflation as measured by the consumer price index. Not surprisingly, many -- such as the Senate Committee and the 1978 Quebec Task Force -- have argued that the expansion of the C/QPP is the most logical means of achieving the income replacement objectives of retirement income policy. Although sentiment appears to favour the preservation of the present mix between public and occupational plans, it is useful to review briefly the central issues regarding the possible expansion of the C/QPP.

In certain respects, extension of the C/QPP would have effects similar to those which would accompany the introduction of mandatory occupational plans. Parallel concerns exist, for example, regarding the questionable net benefit to households with low lifetime earnings. The essential difference relates to the method by which benefits would be financed. Occupational plans would, of course, be funded. The Economic Council raised and (at least temporarily) rejected the possibility of a fully funded supplement to the C/QPP. Those who dissented from the majority recommendations in the Council's report favoured the introduction of a fully funded supplement to the C/QPP. The logic for requiring that any expansion of C/QPP benefits be fully funded is to prevent required contribution rates for Canada's public pension programs from rising too dramatically in the years ahead. Even if C/QPP benefits are not expanded, the required contribution rates must inevitably be increased. This fact, combined with the pay-as-you-go funding of OAS/GIS and the significant ageing of the Canadian population that will occur in the years ahead, indicates that contribution rates that workers in the future will have to pay in order to support these programs will be significantly higher than they are today. The Council estimates, for example, that if present C/QPP, OAS and GIS benefits are (only) preserved in real terms, then the fraction of GNP necessary to meet this commitment will rise from 3.1% in 1981 to 5.2% in 2031 under medium demographic projections. If OAS and GIS benefits are indexed to wages rather than prices, so that the beneficiaries of these programs share future increases in productivity, this ratio would rise to 7.3%, more than double its present level. The contribution rate for the C/QPP, if financed on a pay-go basis after the investment fund is exhausted (around the turn of the century), will rise from the present 3.6% to 10.0% of covered earnings in 2031.[18] In view of these figures and the possibility that any expansion of C/QPP benefits without a commensurate increase in contribution rates might depress personal saving, the consensus view is that any expansion of benefits under the C/QPP must be funded in advance.[19] Today's workers, in short, must save from their own incomes to provide for any further increase in retirement income through these earnings-related public plans. Finally, if an expanded C/QPP were funded on a pay-go basis, implying significantly higher contribution rates as the proportion of retired to active workers increased in the years ahead, the scope for future increases in the real level of benefits provided by OAS and GIS in particular might be limited.

---

[18] Ibid , p. 98.

[19] The Senate Committee recommended that the ceiling under the C/QPP be raised by 50% to 1½ times the average industrial wage and that contribution rates be raised from the present 3.6% to 8% of covered earnings, to be phased in over a period of two years. The report of the COFIRENTES + committee in Quebec (Comité d'étude sur le financement du Régime de rentes du Québec et sur les régimes supplémentaires de rentes, La sécurité financière des personnes âgées au Québec [Quebec: Éditeur officiel du Québec, 1977]), recommended that the income-replacement rate be raised from 25% to 50% of the first half of the maximum pensionable earnings while remaining at 25% for the second half. For a worker whose earnings are at the maximum earnings level, the replacement rate would thus be 37.5%. The Committee also recommended a corresponding increase in the contribution rate, which would be set at 6.8% for the next five years, with modest increases to follow.

Since the latter programs are likely to prove more effective in addressing the problem of poverty among the aged, the case for funding any expanded C/QPP benefit is strengthened.

Finally, the potential economic and political difficulties concerning the investment of CPP funds merit note. At present, the excess of CPP contributions over benefit payments are lent by formula to the provinces at below-market rates of interest.[20] If contribution rates are not increased, the cash flow to the provinces will become negative in the middle to late 1980s as the provinces begin to repay outstanding loans to the CPP. The provinces may be expected to campaign for increases in the CPP contribution rate, even if benefits are not expanded, in order to gain continued access to CPP investment funds. The present situation highlights the potential difficulties posed by the possible expansion of CPP benefits with attendant increases in contribution rates. There is no reason why contributors to the CPP should continue to subsidize current and future taxpayers of the respective provinces by accepting below-market returns on their investments. Yet the provinces, which benefit from the present arrangement, are likely to resist this change. Contributors to the CPP would be best served if the accumulating funds could be invested in private as well as public securities. Yet the provinces would likely insist that at least some specified fraction of CPP funds be earmarked for them. Finally, there remains the difficult problem of administering the large fund that would accumulate under a fully funded supplement to the C/QPP without permitting an undue encroachment of government influence on investment activities in the private sector.

In view of the impending reform of occupational plans and the questionable advantage to households with low lifetime earnings of C/QPP expansion, this option for reform is perhaps less necessary and less attractive than it might at first appear.

Related Issues

Occupational plans in the public versus private sector. Pension benefits, such as vesting and survivorship provisions, are typically more generous in public sector plans. Many public sector plans presently provide for the full and contractual indexing to the consumer price index of pensions in pay. This feature is virtually absent in private sector plans.

---

[20] The provinces pay an interest rate equal to the rate on Government of Canada bonds with a maturity of 20 years or more, which is less than the rate that they would have to pay in the open market.

Since pension benefits, as deferred wages, are simply a part of the employee's total compensation package, economic analysis tends to downplay the importance of comparing the level of pension benefits per se. If comparisons are to be made, then they should focus on total compensation. The only exception to this rule occurs if a particular benefit is available only in the public sector. Full and contractual indexing, in particular, may rest ultimately on the government's ability to underwrite the attendant inflation risk by virtue of its taxing authority.[21] For this reason, parallelism with respect to this particular feature of plan design may be in order. If performance rather than contractual indexing is deemed satisfactory for private sector plans, then the replacement of contractual by performance indexing in the public sector would be appropriate. Indeed, this is the thrust of recent initiatives proposed both by the federal government and the Government of British Columbia. If the federal government provides a vehicle (e.g., price-indexed annuities or a stabilization facility) to enable private sector plans to provide full and contractual indexing, then the present provisions in the public sector plans should be retained.

---

21. If fully indexed benefits are to be paid with certainty by a private sector plan, then: (1) the plan must be fully funded in view of the possibility of firm insolvency, and (2) the funds must be invested in a portfolio whose real return is certain. In practice, (2) cannot be met, although it can be approximated if the plan's funds are invested exclusively in Treasury bills or commercial paper. They would then earn a real return of approximately 1%. From this perspective, employees in the private sector are not sufficiently risk averse that they are willing to earn only a 1% real return on foregone wages (and hence for the plan to be costed at 1%) in order to obtain fully indexed benefits. If the indexing provisions in public sector plans are to be valued in parallel fashion, then the benefits payable under the terms of those plans must also be costed at 1%. Since this is not the current practice, it can be concluded that the value of this benefit in public sector plans is being underestimated. This is an alternative way of making the point in the text. If indexing provisions in the public sector were appropriately valued, as above, then the need for parallelism as discussed in the text would be negated.

Mandatory retirement. Perhaps unfortunately, as noted by the Economic Council, the issue of mandatory retirement has become the focus of the retirement age issue. The relevant facts are these: (1) the continuing trend is toward earlier retirement; (2) there is no hard evidence that significant numbers of workers are being forced to retire because of mandatory retirement provisions; and (3) the elimination of mandatory retirement would create the need for alternative, more costly and potentially disruptive dismissal rules.

Not surprisingly, the Senate Committee recommended a ban on mandatory retirement provisions. The Task Force takes a somewhat eclectic approach, arguing that the burden of proof in future discussions be shifted from those who wish to abolish mandatory retirement to those who wish to retain the practice. The Council opposes its formal abolishment and predicts that mandatory retirement will gradually be eliminated through market forces as the number of older and experienced workers rises relative to the number of new entrants to the labour force. The Council prefers instead that the various levels of government promote policies (perhaps including more flexible hours) which would expand job opportunities for older workers.

Although those who have studied the issue of mandatory retirement are, at the very least, more cautious in advocating its abolishment than the prevailing political climate might suggest, its abolishment remains possible, if not probable. Two points merit emphasis. First, the elimination of mandatory retirement will not of itself reduce the implicit tax burden on future taxpayers associated with the pay-go financing of today's public pension programs (i.e., OAS/GIS and C/QPP). Those who make this argument implicitly assume that either or both of the following benefit retrenchments will accompany a ban on mandatory retirement: (1) the age of entitlement of OAS/GIS will be raised, at least for those who choose to work beyond age 65; (2) benefit payments under the C/QPP will be reduced for those who work beyond age 65. Further, if one of these options is adopted, the effective tax on earnings (i.e., the reduction in public pension benefits) may serve as a major deterrent to work for those beyond age 65. Second, if mandatory retirement is banned, attention must shift to the treatment to be accorded workers who choose to work beyond the date at which they are entitled to pensions from their employer. Note, for example, that if both service credits and contributions were to cease at normal retirement age under the plan, with the employee receiving an unadjusted pension commencing at his retirement date, then there would be a strong disincentive for the employee to work past the normal retirement age.

On balance, the issue of mandatory retirement is far less central to improving Canada's retirement income system than is often suggested. Equally important, surveys indicate that, at present, a major input into many employees' desire to work past age 65 is the uncertainty surrounding the real value of their occupational pensions. Reforms designed to improve the cost-of-living protection accorded pensions in pay should, at least after a transitional phase, eliminate this "by default" motive for employees' seeking to extend their active work lives.

Policy Recommendations

1. The discussion highlights the fact that the problems posed by inflation for occupational pension plans in the private sector raise important questions regarding the adequacy of this element of the retirement income system. The analysis identifies, first and foremost, the importance of costing the pension benefit formula against the benchmark of a noninflationary environment so that both the employer and plan members correctly perceive the true cost of the benefit if it is, at least in principle, to be preserved in real terms in both the accrual and the retirement period. These costs, which plan sponsors and their consulting actuaries should be required to calculate, represent a crucial input into the design of the benefit formula.

   At present, most employer-sponsored plans are valued on the basis of interest rate assumptions which imply that the contribution rates so established can be realized only if both accruing benefits and pensions in pay are eroded by the inflation rate implicit in the interest rate assumption. The use of a real interest rate of, say, 3% to value both current and deferred annuities payable under the terms of the plan would identify the cost of indexing benefits in pay. The use of a real interest rate to value accruing benefits (with the corresponding use of a real salary scale, if required) would identify in addition the cost, again in principle, of price indexing the accumulating credits of active employees. For flat benefit and career average plans in particular, the required increases in contribution rates are likely to be considerable if accruing benefits are to be preserved in real terms. The basic postulate is that only when sponsors and their employees are fully cognizant of these costs will they choose an appropriate benefit formula. As discussed at length in Chapter II, the cost of indexing postretirement or pre- and postretirement benefits may lead at least some plan sponsors and their employees to agree to scale down basic pension benefits.

The use of a real interest rate to value accruing benefits, in addition, will improve the delivery of retirement incomes by employer-sponsored plans in three related ways. First, by requiring that the annuity payable to the vested, terminating employee be costed on the basis of a real interest rate, this innovation will of itself greatly enhance the effectiveness of any move toward earlier vesting. Second, if the capital sum required by this calculation is transferred to a locked-in RRSP, the effective portability of benefits for the mobile employee will be greatly enhanced. In particular, the sum transferred to the RRSP will be sufficient, at least in principle, to insulate the real value of the defined benefit against inflation which occurs both before and after the employee retires. Third, by requiring in effect that the nominal, retroactive benefit improvements which typically occur in flat benefit (especially) and career average plans be prefunded, the use of a real interest rate to value accruing benefits will increase the degree of funding in such plans and hence the security of the benefits so provided.

2. Performance indexing, in which the inflation-augmented or excess investment earnings above, say, 3% are applied to escalating benefits in pay, is likely to provide adequate cost-of-living protection in all but the most adverse (i.e., continually accelerating inflation) circumstances. Full and contractual indexing of benefits in pay by employer-sponsored plans in the private sector will require a parallel initiative by the federal government to assume the attendant inflation risk. The federal government could issue index bonds, sell price-indexed annuities, stabilize real returns or provide inflation insurance. On balance, the likelihood that performance indexing if appropriately designed will deliver adequate cost-of-living protection, together with the administrative costs (and possible ramifications) of the government initiatives to facilitate contractual indexing, suggest that performance indexing be given serious consideration.

3. If contractual indexing is introduced for employer-sponsored plans in the private sector, then it should remain in public sector plans as well. If performance indexing is introduced for private sector plans, then it should also replace contractual indexing in public sector plans.

The reason for parallelism stems ultimately from the fact that, at present, plan sponsors in the private sector do not have access to an investment vehicle that would permit them to introduce contractual indexing. If the taxing power of government is ultimately required to underwrite the inflation risk that accompanies contractual indexing, then to limit its accessibility to public sector plans is difficult to justify. The fact that performance indexing is likely to provide adequate, if not complete, protection against inflation again merits note. Also pertinent is the fact that there typically exists in the public sector a supplementary plan to provide for the indexing payments. This practice greatly complicates the problem of determining, again in principle, whether the contribution rates are set at a sufficiently high level to fund indexed benefit payments. The use of a real interest rate to value the benefits payable under the combined plan would be more useful in this regard.

4. The move toward earlier, if not immediate, vesting appears to be inevitable. Although there are important caveats regarding the economic impact of this initiative, it should logically be accompanied by the requirement that the capital sum necessary to purchase the deferred annuity be transferred to a locked-in RRSP. Further, if the real value of the defined benefit is to be preserved, the capital sum should be determined using a real interest rate of, say, 3%. If the mobile employee belonged to plans with an earnings-related benefit formula, the actual pension would resemble the benefit provided by a career average plan in which each year's earnings had been updated for inflation. Sufficient funds would exist, again in principle, to fully preserve the real value of this benefit during the employee's retirement years.

   Even with the use of a real interest rate to capitalize the requisite annuity, the advantage conferred by earlier vesting to the young employee in a contributory, defined benefit plan may still be illusory. In practice, a scheme could be developed -- such as that devised by Saskatchewan in a proposed amendment to its Pension Benefits Act -- whereby the employee's own contributions with interest cannot purchase more than 50% of the promised benefit. Any excess would be returned to the employee, while the capital sum necessary to purchase the annuity would be transferred to a locked-in RRSP.

5. The achievement of truly portable pensions, in which the pension credits of the terminating employee are

transferred to the plan provided by a new employer, will be difficult but not impossible. By requiring that benefits be valued at a statutory and thus standard real interest rate, the previously discussed initiative would facilitate the actuarial calculation of the lump sum payment required from the initial employer if the credit earned under the terms of the plan is to be transferred to the plan offered by the new employer.

Requiring that the deferred annuity payable to a terminating employee be valued on the basis of a real interest rate and the corresponding capital sum transferred to a locked-in RRSP would solve most of the problems posed by the absence of truly portable occupational pensions. There appears to be little merit in the schemes proposed by the Task Force on Retirement Income Policy to update the value of deferred pensions. For flat benefit and career average plans, the proposal is that deferred pensions be updated by an amount no less than the amount by which the benefits would have been updated had the employee remained at the same job. The proposal would serve as a strong disincentive for employers and their active employees to include plan improvements as part of the employees' compensation package. The objective of providing sufficient funds, at least in principle, so that deferred pensions can increase in real terms can be achieved by an appropriate reduction in the real interest rate used to calculate the capital sum necessary to meet the defined benefit.

6. The introduction of a mandatory benefit for the surviving spouse would improve the retirement income provided elderly women in particular. To prevent the arbitrary redistribution of wealth (for example, from single to married employees), the defined benefit should be actuarially reduced for the married employee at the time of retirement.

   Requiring that a mandatory provision for the surviving spouse be linked to an unreduced pension for the married employee ignores not only these distributional effects, but also the changing labour force status of married women in particular. Significantly, both the Economic Council of Canada and the Government of Saskatchewan in proposed amendments to its Pension Benefits Act explicitly support the actuarial reduction of the pension provided a married employee if a mandatory survivor provision is introduced.

7. The absence of a well-publicized plan termination (by firm insolvency, plant shutdown, etc.) in which employees fail to receive the full value of their vested bene-

fits has placed, perhaps inappropriately, the issue of the security of benefits "on the back burner."

Since plan provisions typically limit the employer's obligation to the lesser of vested or funded benefits, the above situation could well occur if an underfunded flat benefit plan were terminated. The prior recommendation that plan sponsors be required to value annuities payable under the terms of the plan as well as accruing benefits on the basis of a real interest rate will effectively require plan sponsors to prefund the nominal, retroactive benefit improvements that periodically occur in the union sector. As a result, the funded status of flat benefit plans will gradually improve, thus reducing both the likelihood of a catastrophic plan termination and the attendant likelihood of a hurried and more dramatic policy initiative.

8. Previously discussed initiatives designed to improve the delivery of retirement incomes through occupational plans will do nothing to assist those who are not covered by (i.e., are not members of) such plans.

   Economic analysis indicates that the ultimate incidence of mandated employer contribution will likely fall upon the employee. Mandating employer-sponsored plans (or increasing the benefits and contributions to the earnings-related C/QPP) will force low-income workers to allocate a higher fraction of their lifetime earnings to providing for their own retirement. Because of the reduced access to income-tested programs such as GIS and the various provincial "top-offs," low-income workers may in fact be less well off than they are under the present system. So long as the various levels of government encourage the growth of occupational pension plans, and so long as the federal government retains sufficient flexibility to improve over time the real level of benefit provided by the GIS, the more dramatic initiatives of either mandating employer-sponsored plans or expanding the C/QPP can probably be avoided without greatly compromising the objective of improving the delivery of retirement incomes.

9. If the decision is made to expand the C/QPP with or without the option for employers who offer plans which meet minimum defined standards to contract out, there is strong argument for requiring that the supplement be fully funded.

   The inherent problems associated with introducing a fully funded supplement to the C/QPP, together with the attendant expansion of the role of government, will suggest to many that mandated occupational plans might be preferred. Again, however, the net benefit to low-income workers is questionable, and there exists the likelihood that the effectiveness of the retirement income system can be enhanced without requiring so dramatic an initiative.

10. Pension benefits, on the whole, are richer in public than in private sector plans. If public sector employees either choose or are required to devote a higher fraction of their total compensation, the comparison of pension benefits in the two sectors is per se of limited usefulness. The crucial issues then become: (a) can employers in the private sector offer comparable benefits, given their need to finance benefits from earnings rather than from tax revenues; and (b) are employers and employees appropriately valuing the benefits -- especially the indexing provisions -- in the context of their total compensation package?

    Parallelism with regard to cost-of-living protection to pensions in pay would appear to be appropriate. Performance or contractual indexing should characterize both public and private sector plans. For other benefits which could easily be provided by private sector plans, such as richer survivorship provisions, the case for parallelism is far less compelling.

11. The fact that the issue of mandatory retirement has become the focus of the debate regarding retirement age is perhaps unfortunate. The continued trend toward earlier retirement, the lack of hard evidence that large numbers of employees are being involuntarily retired and the need for alternative, more costly and potentially disruptive dismissal rules if mandatory retirement is prohibited, receive too little attention.

    Given the likelihood that improved cost-of-living protection to pensions in pay will reduce the "default" motive for delayed retirement, and market forces will lead to the gradual disappearance of mandatory retirement if the situation is warranted, the need for immediate action on this front is far less compelling than on most of the issues raised in this report.

Chapter II

VALUATION ASSUMPTIONS AND THE COSTING OF OCCUPATIONAL PENSION PLANS IN AN INFLATIONARY CLIMATE

Analysis of Interest Rate and Salary Scale Assumptions

Introduction. If sufficient funds are to be set aside, at least in principle, for the benefits payable under flat benefit, career average and final earnings plans to be fully indexed against inflation, then the annuities payable under the terms of such plans must be valued or costed at a real interest rate. If a plan is costed on the basis of a nominal rate which contains an inflation premium, then the required contribution rate is set on the implicit assumption that the real value of pension claims will be eroded by inflation which occurs in the retirement period and, in most cases, in the preretirement period as well. Assuming that the salary scale assumption (if applicable) embodies the same inflation factor as does the interest rate assumption, the use of a nominal interest rate to cost the plan and thus establish the required contribution rate implies -- with the sole exception of a final earnings plan in which the benefit is tied to earnings in the very last year of employment -- that the real value of accruing benefits will be eroded by inflation which occurs in the employee's active work years. Thus the fact that a high interest rate assumption may be accompanied by a high salary scale assumption is not in general sufficient to guarantee that the contribution rate is set sufficiently high to preserve the real value of accruing benefits.

For terminated vested employees, the implied erosion of the real value of the deferred pension is directly analogous to that of a retired employee who begins to draw a current, fixed-dollar annuity. Indeed, because the annuity of the terminated employee is deferred, the impact on the capital sum required to purchase the annuity payable under the terms of the plan is far more dramatic if a nominal rather than a real rate is employed because the interest factor applies both to the annuity itself and to the period from the worker's termination to the commencement of the pension.

Historical data suggest that the real return that might reasonably be earned by a representative pension fund in Canada is not likely to exceed 4%. For the fixed-income portion of the portfolio, the real return is not likely to exceed 3%. From this perspective, it is useful to examine the interest rate assumptions that have been employed by plan sponsors to formally value and thus cost the benefits payable under the terms of their plans.

The valuation assumptions. Data on the interest rate assumptions employed to value pension liabilities are readily available from two sources: surveys conducted by the Pension Commission of Ontario in 1972, 1975 and 1978 of the large pension plans under its supervision, and a survey conducted in the fall of 1979 by the Financial Executives Institute Canada (FEIC). Because the dates of the actuarial valuations vary over a smaller range, and since figures are available by benefit formula, the FEIC data probably provide a more accurate picture of present interplan variation in valuation assumptions. The Commission's data, in addition, illustrate the variation in the interest rate assumption that has occurred over time. The Commission's and the FEIC data are summarized in Tables 1 and 2, respectively. The Commission's data include a few public sector plans, whose assumptions are representative of the population as a whole, while the FEIC data consist exclusively of plans in the private sector.

Both sets of data highlight the apparent latitude that plan sponsors and their actuaries enjoy in choosing their valuation assumptions.[1] The Commission's surveys also indicate a secular increase in the interest rate assumption over time, as the mean assumption rose steadily from 4.34% in 1969 to 5.45% in 1978. The FEIC data highlight the cross-sectional variation, which is apparently common to all benefit formulas. The grand mean assumption of 5.56% is slightly higher than the corresponding figure in the Commission's 1978 survey, presumably reflecting the continued upward movement in long-term interest rates.

Finally, as evidenced by the figures reported in Table 1, the vast majority of plans are costed on interest

---

[1] At present, the Department of National Revenue, which is concerned with limiting access to the tax subsidy accorded plan contributions, requires "normally" that the interest rate assumption not exceed the salary scale assumption. The Pension Commission of Ontario, for its part, discourages the use of an interest rate assumption in excess of 7% and will only permit such rates on rare occasions. Although not shown, the mean spread between the interest rate and salary scale assumptions appears to have declined in recent years, implying ceteris paribus higher contribution rates. The Commission's data indicate, for example, that this mean spread fell from 2.14% in 1972 to 1.13% in 1978.

Table 1

The Interest Rate Assumption: Plans Supervised by the Pension Commission of Ontario

Year of survey	Plans in sample	Interest rate (%): Number of plans						Mean	Standard deviation	Yield on long-term Canada bonds (%)
		less than 4	4-4½	5-5½	6-6½	7-7½	8 or above			Mean
1969	84	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4.34	n.a.	6.10
1972	128	1	60	72	5	0	0	4.81	0.51	7.50
1975	128	0	37	70	21	0	0	5.10	0.52	7.88
1978	150	0	26	73	41	9	1	5.45	0.78	8.97

Source: Unpublished data provided by the Pension Commission of Ontario.

Notes:

1. Data refer to the latest (triennial) actuarial report approved by the Commission for self-administered trusteed or insured deposit administration/segregated fund) plans with 1 000 or more active members.

2. Yield on long-term Canada bonds is the average interest rate during the three years prior to the survey data on Government of Canada bonds with ten or more years to maturity.

Table 2

The Interest Rate Assumption: Plans Surveyed by Financial Executives Institute Canada, Fall 1979

Benefit formula	No. of plans	Interest rate (%): Number of plans										Mean
		less than 3	3.0-3.9	4.0-4.4	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5 or above	
Final earnings	117	1	1	8	19	18	37	12	12	8	1	5.59
Career average	38	0	0	4	3	10	16	1	3	0	1	5.51
Flat benefit	27	0	1	3	7	7	6	1	1	0	0	5.10

Source: FEIC, Report on Survey of Pension Plans in Canada (Toronto: Financial Executives Institute Canada, March 1980), Appendix J.

rate assumptions which are significantly less than current market rates, as represented by the yield on long-term Government of Canada bonds.

On the premise (to be explored later) that these recorded valuation assumptions are those used by sponsors and their employees in valuing pension claims in the context of employee compensation, a number of important observations are in order. First, since the valuation assumptions typically exceed the likely ceiling on the real interest rate, the plans are being costed on the implicit assumption that the real value of pension claims will be eroded by inflation when they become payable. Indeed, for flat benefit and career average plans, the inference is that the real value of pension claims will be eroded by inflation even as they accrue during the plan member's work years. Second, there is substantial interplan variation in the interest rate assumption, indicating that mandatory indexing, whether contractual or performance, will have cost implications that vary sharply across plans. Third, the vast majority of plans are costed on interest rate assumptions which are significantly less than current market rates. Industry spokesmen might attribute this result to the inherently conservative nature of actuarial valuations. A possible economic interpretation (to be explored later) is that plan sponsors act as if they have an implicit commitment to make cost-of-living adjustments to the extent that the investment return on the plan's assets exceeds the interest rate assumed in the actuarial valuations.

Final earnings plans together with career average plans funded on a level premium (projected benefit) basis require a salary scale assumption. Inspection of the data underlying Tables 1 and 2 indicates that those plans which use a high interest rate assumption also use a high salary scale assumption, and conversely. In the cost simulation exercises outlined later in this report the spread between the (reported) interest rate assumption and the salary scale assumption is treated as constant. As noted, with the sole exception of an extreme final earnings plan, pairing a high interest with a high salary scale assumption to cost a plan does not produce a contribution rate which is sufficiently high to preserve, in principle, the real value of accruing benefits. It should also be emphasized that the use of a high interest rate assumption is not confined to plans which also use a salary scale assumption. In the Commission's 1978 survey, for example, the mean interest rate assumption for those plans which reported both an interest rate and a salary scale assumption was 5.56%, compared to 5.37% for those plans which reported only an interest rate assumption.

Finally, there is no reason to believe that the figures reported in Tables 1 and 2 are not representative of those generally employed in formal plan valuations. Although compiled from different sources (and perhaps for different purposes), the numbers in the two tables are quite consistent. In addition, employee benefits consultants confirm that the valuation assumptions employed in the formal, say, triennial reviews required by the Pension Commission of Ontario are typically those adopted by employers' and employees' representatives in their formal negotiations over wages and fringe benefits.

Employee Valuation of Pension Claims and Reported Valuation Assumptions

Indexing, whether performance or contractual, requires that a real interest rate be used to value the annuities payable under the terms of a defined benefit plan. Differences between the interest rate assumptions reported in Tables 1 and 2 and the real interest rate indicate, in a straightforward and mechanical fashion, the extent to which contribution rates must rise if mandatory indexing is introduced and benefit formulas remain unchanged. Since employer contributions to pension plans represent a form of employee compensation, it is reasonable to assume that the full incidence of such increased costs as they pertain to future service will fall ultimately on the employee. The extent to which employee compensation in the form of pension entitlements will increase, and thus ceteris paribus the extent to which compensation in other forms must fall, depends crucially on the role of the reported valuation assumptions in the context of employee compensation. This issue, which raises the possibility that employees may agree to the retrenchment of other pension benefits if indexing is introduced, is explored below.

Assume first that the labour market is adequately approximated by an auction model. Workers thus receive in every period compensation equal to the value of their marginal product, and value only the benefits legally due under the terms of the plan. In the absence of a legal commitment to either full or partial indexing, workers use the prevailing (pretax)[2] nominal rate of interest to value accruing pension benefits. By discounting nominal benefits by a nominal interest rate, workers determine the value to be accorded pension benefits in the context of the trade-off between current and deferred wages. The reported valuation assumptions are just a shell, and the contribution rates so determined bear not at all on employee valuation of pension claims.

---

[2] In view of the fact that workers have access to RRSPs as an alternative vehicle through which to obtain access to the tax subsidy associated with registered pension contributions, the pretax nominal rate of interest should be used by rational workers to value accruing pension benefits

The stylized fact that ad hoc cost-of-living payments to pensions in pay are common in the nonunion sector suggests, however, that the auction model may be too restrictive. Further, many analysts, including academic researchers, have used employer contributions to occupational plans to measure the value to workers of their accruing pension benefits. Yet the auction model suggests that the contribution rates established by formal plan valuations are not relevant to employee valuation of accruing pension benefits since they are not calculated at the prevailing nominal interest rate.

Both considerations, especially the prevalence of ad hoc cost-of-living adjustments, suggest that an alternative model of employee valuation of pension claims may have greater empirical validity. Consider, for example, the implications of an implicit contract model in which employers agree to commit investment earnings above the assumed valuation rate to making ad hoc plan amendments or cost-of-living adjustments.[3] Those employers who cost their plans at low interest rates convey their commitment to employees by the high contribution rates so established. Thus the contribution rates established in formal plan valuation do reflect the value to employees of their accruing pension benefits,

---

in the context of the trade-off between current and deferred wages. If the benefit is payable with certainty, as implicitly assumed in the subsequent discussion, the risk-free nominal rate is appropriate.

[3] Workers in this implicit contract model presumably receive over their lifetimes compensation whose present value equals that of their marginal product. When young, workers receive compensation that is less than the value of their marginal product, and conversely when they are old. If workers are fired for malfeasance, they forego the rents that otherwise would accrue to them in later years. This restructuring of compensation payments, which is probably widespread, creates additional incentives for workers to perform at a high level in spite of the fact that employers may have difficulty in monitoring their productivity on a day-to-day basis.

and the attention devoted by analysts to employer contributions per se becomes warranted.

Institutionally, the sequence of events under the implicit contract model is as follows. Those plan sponsors who use a low interest rate assumption will benefit from larger experience or actuarial surpluses, or suffer smaller experience or actuarial deficits. Those plan sponsors with the most favourable actuarial experience, in turn, will be the ones most likely to grant ad hoc increases to pensions in pay. Industry observers suggest that this postulated link between actuarial experience and ad hoc cost-of-living adjustments is likely to have some merit. Indeed, this interpretation receives further support from the tendency for at least some sponsors to explicitly fund for surplus by adopting a low interest rate, thereby placing the sponsor in a position to make more generous ad hoc cost-of-living adjustments. There are also cases in which this variant of performance indexing is written into the by-laws of the pension plan. Consider, for example, the amended by-law to the Toronto Transit Commission's Pension Fund Society:

> Effective January 1, 1979, the pension payable to Associate Members may be adjusted annually by a percentage, such percentage to be equal to the excess of the rate of interest earned by the fixed income portion of the Fund over the valuation interest rate used by the Actuary in respect of the Associate Members, as computed by the Actuary and approved by the Society.

The auction or shell model suggests, by contrast, that only benefits per se are factored into employee compensation. If two firms offer the same current wage and the same benefit formula (say, 2% of each year's earnings), then employees will attach equal value to accruing pension benefits and thus to the total compensation packages. The fact that one employer may value his plan at a lower interest rate, thus requiring higher employer contributions, is ignored by actual and prospective employees. In the absence of formal indexing provisions, employees thus value their accruing pension benefits at the market (and hence nominal) interest rate, not at the reported valuation rates. Plan sponsors choose either a high or a low interest rate to value their plans on the basis of unrelated considerations, such as current or projected cash flows, and neither the employer/sponsor nor employees attach weight to these assumptions in the context of employee compensation. If the plan sponsor chooses a valuation rate which is less than the market rate, the attendant actuarial gains will accrue to his benefit, not to the benefit of the employees. This result is the exact opposite of that indicated by the implicit contract model.

The implications of these two models of the employee valuation of pension claims can be summarized as follows. Under the implicit contract model, the difference between the reported valuation assumption and the real interest rate will determine not only the required increase in the contribution rate if indexing is introduced, but also the value of this improvement to the employee. Under the shell model, this same calculation will, in a purely mechanical sense, continue to determine the required increase in the contribution rate. The value of this improvement to the employee, however, will be larger since the change is now from a purely nominal to an indexed benefit. The value of this improvement to the employee will thus reflect the (larger) difference between the current market or nominal rate and the real interest rate. Since this incidence of the cost of indexing (or any other improvement in the nonwage portion of employee compensation) should ultimately fall on the employee if labour markets are competitive, the required concession in current wages -- or perhaps other benefit retrenchment -- is greater under the shell model.

Available data do not permit a formal investigation of the link between cost-of-living increases and reported valuation assumptions, and thus it is not possible to directly test the key prediction of the implicit contract model. In fact, neither the auction nor the contract model is likely to have universal validity. In view of the fact that the majority of plan sponsors do make ad hoc cost-of-living payments to pensions in force, the auction model is clearly likely to overstate, on average, the increase in the value to employees of moving from a formally nominal to a contractually indexed benefit. At the same time, many, especially small, employers do not make ad hoc payments, and for them the prediction of the auction model may prove accurate. Both models are cited in the subsequent discussion.

The Impact of Mandating Pre- and Postretirement Indexing on Contribution Rates and Unfunded Liabilities

If a performance indexing scheme were introduced which required that investment earnings in excess of 3% be applied to escalating pensions in pay, then a rational plan sponsor would employ an interest rate assumption of at most 3% to cost the retirement annuities payable under the terms of the plan. If indexing were to apply to future service only, then the replacement of the interest rate assumption currently used to value these annuities by the 3% figure would accurately reflect the necessary increase in contribution rates, given the benefit formula. If a contractual indexing scheme were introduced, accompanied, say, by the sale by the federal government of price-indexed annuities at a real interest rate of 3%, an analogous result would obtain. If either indexing scheme were extended to past service credits, then an unfunded liability would be created. This unfunded liability, in turn, would reflect the difference between the prior interest rate assumption and the 3% rate embodied in each of the indexing schemes. The purpose of this section of the study is to analyze the cost implications of these and related initiatives for simplified defined benefit plans.

The reported exercises (see Table 3) illustrate the impact of various indexing initiatives on contribution rates for a flat benefit, a career average and a final earnings plan for both accrued benefit and projected benefit funding.[4] The benefit in the career average plan is 2% of each year's earnings; in the final earnings plan, 2% of earnings in the final year of employment times the number of years of service; in the flat benefit plan, a fixed amount equal to 2% of earnings in the first year of employment (projected benefit funding) or 2% of the earnings of a representative member at age 40 (accrued benefit funding), both times the number of years of service. Plan members are assumed to remain with certainty in the plan until age 65 and to draw their pensions for exactly 15 years. The issues of termination and vesting, as well as the more complex benefit structures of actual plans, are thus ignored.

Two distinct exercises are conducted. If indexing is to apply only to benefits in force, then this postretirement indexing requires, in the examples at hand, that the annuities payable under the respective plans be valued at a real interest rate. If the initiative is designed to preserve the real value of benefits as they accumulate, then this pre- and postretirement indexing to the price level requires a more complicated calculation. Because the benefit is tied to the earnings in the very last year of employment in the final earnings plan, and since, by construction, the inflation factor is the same in both the interest rate and salary scale assumptions, this benefit is effectively in-

---

[4] Under accrued benefit funding, the normal cost (and hence contribution) is the value of the benefit earned in the current year of service. Under projected benefit funding, the normal cost is the level dollar amount or level percentage of pay over the work life of the employee necessary to meet the actuarial cost of the indicated benefit.

Table 3

Interfirm Variation in Valuation Assumptions: Impact on Estimated Costs of Pre- and Postretirement Indexing

		Contribution Rate (% covered earnings)				
			Indexed: real interest rate (i)			
		Not indexed	Postretirement (only)		Pre- and postretirement	
			i=2.0	i=3.0	i=2.0	i=3.0
Projected benefit funding (entry age 30):						
Career average	r = 7.5, g = 6.4	5.89	8.48	7.90	18.24	14.47
	r = 4.2, g = 3.1	11.14	12.97	12.09	18.24	14.47
Final earnings	r = 7.5, g = 6.4	14.76	21.23	19.80	21.23	19.80
	r = 3.0, g = 1.9	19.80	21.23	19.80	21.23	19.80
Flat benefit	r = 6.7, g = 5.6	2.18	2.99	2.78	15.50	10.18
	r = 3.5, g = 2.4	8.26	9.17	8.55	15.50	10.18
Accrued benefit funding (age 40:)						
Career average	r = 7.5 --	2.55	3.67	3.44	15.72	11.41
	r = 4.2 --	7.79	9.07	8.46	15.72	11.41
Final earnings	r = 7.5, g = 6.4	13.68	19.69	18.35	19.69	18.35
	r = 3.0, g = 1.9	18.35	19.69	18.35	19.69	18.35
Flat benefit	r = 6.7 --	3.54	4.85	4.19	15.72	11.41
	r = 3.5 --	9.73	10.80	10.07	15.72	11.41

Notes

1. The range of interest rate (r) assumptions, by benefit formula, is drawn from FEIC, Survey of Pension Plans in Canada, Appendix J. Salary scale assumptions (g) are determined by subtracting the grand mean interest rate/salary scale spread of 1.1% from corresponding interest rates.

2. The benefit in career average plans is 2% of each year's earnings; in final earnings plans, 2% of earnings in the final year of employment for each year of service; in flat benefit plans, a fixed amount equal to 2% of earnings in the first year of employment (projected benefit funding) or 2% of earnings of a representative member at age 40 (accrued benefit funding), both times years of service. Plan members remain with certainty in the plan until age 65, and draw pensions for exactly 15 years.

3. The real interest rate of 2%, combined with the nominal rate of 7.5%, implies an inflation rate of 5.5%, etc. The constant interest rate/salary scale spread of 1.1% implies that real salary growth is 0.9% when the real interest rate is 2% and 1.9% when the real interest rate is 3%.

dexed during the preretirement period. This well-known feature of a final earnings plan results, in the exercise at hand, in no additional cost if the indexing requirement is extended to the preretirement period. In the flat benefit and career average plans where, in the absence of plan amendment, inflation erodes the real value of pension claims even as they accumulate, the extended indexing requirement does impose additional costs. In the case of accrued benefit funding, for example, this extension would require that the relevant real interest rate be used to discount the accrued benefit in both the pre- and postretirement periods.

To highlight the differences between plans in the increase in contribution rates necessitated by both variants of the indexing initiative, it is useful to examine for each formula the full range of possible adjustments under the implicit contract model. This is accomplished, using the data reported in Table 2, by examining the change in contribution rates for those plans using the highest and the lowest interest rate assumption. The salary scale was then chosen by imposing a constant interest rate/salary scale spread of 1.1% for all plans, a procedure which appears to be reasonable based on the observed data. Interest rates of 2% and 3% were chosen for illustrative purposes as the hypothetical real rates embodied in either of the indexing schemes.

The results (Table 3), while only suggestive of the impact on the more complicated plans that actually exist, highlight the likely magnitude of required increases in contribution rates. Consider, for example, the impact of imposing postretirement indexing (only) in the form of requiring that excess earnings above 3% be applied to escalating benefits in force. Under projected benefit funding, the contribution rate would rise from 5.89% of covered earnings to 7.90% for career average plans initially valued at an interest rate of 4.2%. The economic interpretation of this result in the context of the implicit contract model is as follows. Assume that the real rate is 3% and that the nominal rate is 7.5%, so that the expected rate of inflation is 4.5%. Then the plan that is valued at 7.5% is premised on the real erosion of accrued benefits at 4.5% per year during the preretirement period, compared to 4.2 - 3.0 = 1.2% for the plan valued at 4.2%. The plan valued at the lower rate, in effect, contains an implicit commitment to escalate the value of accrued benefits at 3.3% per year, which necessitates the higher contribution rates. An analogous result holds if the nominal rate exceeds 7.5%, in which case the real erosion of accrued benefits is still limited to 4.5% and 1.2%, respectively, in the plans valued at the high and the low interest rate. If both pre- and postretirement indexing are required, using the 3% benchmark rate, then the required contribution rate rises to 14.47% of earnings for both plans. This result, which reflects the facts that: (1) the benefit formulas are the same, and (2) the benefits are now fully indexed, indicates, of course, a much sharper increase for the plan which was originally valued at the higher rate. The very sharp increases in required contribution rates for flat benefit plans under pre- and postretirement indexing merits note. In fact, flat benefit plans are typically amended at each contract renewal. Improvements in the benefit formula are usually applied to past service, reflecting an ongoing intergenerational transfer scheme among workers. From this perspective, the sharply higher figures reported in Table 3 indicate the impact of requiring that plan sponsors cost the benefits in real terms on a continuing basis rather than periodically revising the benefit formula and thus establishing new unfunded liabilities. Finally, the contribution rates for both pre- and postretirement indexing are greater for the final earnings than for the career average plans which, in turn, exceed the rates for the flat benefit plans. This result simply mirrors the assumed increase in real wages in the calculations, together with the respective benefit formulas.

Regardless of whether or not all employees correctly perceived the implications of the assumptions under which their pension benefits were being valued, these figures highlight the fact that the legislation of, say, performance indexing will substantially increase pension costs and/or lead to a retrenchment in benefit formulas. The trend toward the enrichment of benefit formulas continued during the 1970s, in spite of the continued high inflation. During the period from 1970 to 1978, for example, membership in final earnings or career average plans in which the benefit equalled or exceeded 2.0% per year of service rose from 65.4% to 75.4% at the total.[5] As noted, ceteris paribus, the impact of such benefit enrichment on contribution rates would be reduced to the extent that valuation assumptions mirrored the upward trend in nominal interest rates. Using the formulas employed to construct Table 3, it is straightforward to calculate the reduction in the benefit formula which will hold the required contribution rate constant. If only postretirement indexing at a real rate of 3% is required, for example, the benefit would have to be reduced from 2.0% to 1.49% per year of service in both the final earnings and career average plans which were originally valued at an interest rate of 7.5%.

---

[5] Statistics Canada, Pension Plans in Canada 1978, cat. no. 74-401 (Ottawa: Supply and Services Canada, 1979) p. 34.

If indexing is to be applied to past credits as well, then plan sponsors would face an increase in unfunded liabilities pertaining to this service. The simplest example is to consider a plan that is fully funded at its initial valuation rate but must now cost the annuities already due under the terms of the plan at the real interest rate. Suppose, for example, that the plan is fully funded, at the initial valuation rate, with respect to a member who is about to retire at age 65. (If the valuation rate is beneath the market or nominal rate, it is assumed that there exists an implicit commitment by the plan sponsor to provide ad hoc cost-of-living increases proportional to the excess of investment earnings above this valuation rate.) Assuming that the plan member will draw a pension for exactly 15 years, the unfunded liability is simply the difference between the capital sum required to purchase this fixed-dollar annuity at the real rather than the valuation rate. If the real rate is 3% and the valuation rate is 4%, then for each $1 000 of pension benefit this capital sum rises from $11 118 to $11 938, creating an unfunded liability of $820. Correspondingly, the unfunded liabilities corresponding to initial valuation rates of 5%, 6%, 7% and 8% are, for each $1 000 of pension benefit, $1 158, $2 220, $2 830 and $3 379 respectively.

Finally, a comment is in order regarding the simplified or stylized plans used in Table 3 to identify the implications for contribution rates of requiring either postretirement or pre- and postretirement indexing. The alternative is to perform computer-based simulations of the more detailed plans that actually exist, an exercise which would also entail a much more detailed set of economic assumptions such as labour turnover, mortality and so forth. Since this latter exercise is not feasible at the present time, it is important to ask whether or not the results presented for the stylized plans are indeed likely to be representative of the more detailed plans. Two points merit note. First, because of the absence of decremental factors such as labour turnover, the contribution rates identified in Table 3 clearly overstate the contribution rates that would be required to discharge the simplified benefit formulas. The increase in the contribution rates associated with a given change in the valuation interest rate will be overstated on this account. Second, a comparison of the sensitivity of the stylized plans to changes in the interest and/or salary scale assumption with the sensitivity analysis conducted by the Task Force on Retirement Income Policy indicates that the impact on the contribution rates of changes in the interest rate and/or salary scale (especially) assumptions is greater in the stylized plans.[6] For a given range in interest rate assumptions, the results reported in Table 3 may thus overstate the corresponding range in required contribution rates. In spite of this caveat, how ever, the results summarized in Table 3 undoubtedly reflect in qualitative terms the nature of the impact on plan costs of mandating postretirement or pre- and postretirement indexing.

The Incidence and Redistributive Aspects of Alternative Indexing Initiatives

The mechanics, in terms of increased contribution rates, if either contractual or performance indexing were required with respect to future service credits (only) have been summarized in Table 3 and the attendant discussion. If such indexing were also extended to past service credits so as to produce an immediate impact on the cost-of-living protection provided retirees or those approaching retirement, then a corresponding increase in unfunded liabilities would be created.

The fact that the income redistributive effects of potential initiatives are potentially controversial is easy to establish. There are those who argue that the deferred wage component represented by pension claims is implicitly defined in real terms and thus, at a minimum, today's pensioners are entitled to the excess or inflation-augmented investment earnings in the form of continuing, ad hoc cost-of-living increases to pensions in force. Some of these observers have gone so far as to state that pensioners are being "robbed" in the absence of such adjustments. Spokespersons for the business community, however, have emphasized that pension funds are operated by shareholders on behalf of pensioners in order to better secure pension benefits in the event of firm insolvency. Pension entitlements are defined in nominal terms, they note, and shareholders, not the pensioners, own the plan's assets in the sense that they stand to gain if investment performance is favourable and to lose if it is unfavourable. Excess earnings, in short, belong to the shareholder. Today's pensioners, on the basis of their past service, are not justifiably entitled to the cost-of-living adjustments advocated by the proponents of the first position.

---

[6] Using an initial interest rate assumption of 6.5% and a salary scale assumption of 5%, the results reported by the Task Force indicate that ceteris paribus a decline of 1% in the interest rate assumption will raise required contribution rates by 14% for the flat benefit plan, 14% for the career average plan, 17% for the final earnings plan with a basic credit of 2% of final salary for each year of service, and 14% for the final earnings plan with a basic credit of 1.5% of final salary for each year of service. For the stylized final earnings plan analyzed in Table 3, this same decline in the interest rate will raise the required contribution rate by 25%. Although the actuarial valuation techniques employed to produce these estimates are not strictly comparable, the greater interest sensitivity in the stylized plan is apparent. Interestingly, in his well-known text, Dan McGill (Fundamentals of Private Pensions [Homewood, Ill.: Richard D. Irwin, 1979]) cites a "rule of thumb" that a 1% reduction in the interest rate assumption will reduce estimated pension costs by about 25%.

Which of these conflicting views is valid? To start, it must be recognized that both sets of remarks pertain to current pensioners and thus implicitly refer to possible adjustments linked to prior service credit. The question of who owns the excess earnings related to the funds established to discharge these obligations is grounded ultimately in the valuation of accruing pension benefits during the active work years of the now retired employees. This result, together with the continued necessity of distinguishing between past and future service credits, is addressed below.

Assume, as in the auction model, that workers sell their labour services in competitive labour markets and thus can never be paid less than the value of their marginal product. Analogously, employers need pay no greater amount, so that a worker's (anticipated) compensation in every period is exactly equal to the value of his marginal product. Consider now the implication of mandating either contractual or performance indexing with regard to future service only. The implication of the above assumptions is that the full incidence of the increase in required costs will fall on the employee, who must accept either: (1) a higher fraction of his total compensation in the form of deferred wages or (2) offsetting reductions in other aspects of the pension benefit formula. The Task Force on Retirement Income Policy, for example, recognizes the possibility that the move toward indexing may be accompanied by a reduction in the initial level of the pension itself, although a careful assessment of this cost issue is not developed. The extent to which employees must accept either (1) or (2) is linked, in the implicit contract model, to the reported valuation assumptions. To the extent that this model is valid, the difference between the reported interest rate assumptions and the real interest rate embodied in the indexing initiative will be the key determinant, given the benefit formula, of the required increases in contribution rates. If the reported valuation assumptions are just a shell, then the (larger) difference between the market rate and the real rate will be the key determinant of the (larger) increases in contribution rates.

Under both the implicit contract and shell models, especially the latter, the introduction of indexing may well lead employees to choose to retrench on other features of the benefit formula. Quite simply, the fraction of their total compensation that employees are willing to devote to deferred wages may not be sufficient to buy indexed pensions at the present level of basic benefits. It is therefore not appropriate to introduce indexing while simultaneously seeking to protect employees by outlawing such retrenchments. As emphasized, the incidence of any increase in pension costs related to current or future service falls entirely upon employees in competitive labour markets. Employers often discuss the cost implication of pension reform as if the full incidence fell on the employer/shareholder, while economic analysis would tend to suggest otherwise. Legal impediments to retrenchment in benefit formulas, the unlikelihood (one suspects) of employees actually taking a cut in nominal wages and other factors may initially prevent the full incidence of increased costs from falling on the employee. If competitive labour markets ensure that employees receive only the value of their marginal product, then the ultimate incidence of increased pension costs must fall on them.

Extending indexing to past service credits will, in fact, have unambiguous redistributive effects. Under both the implicit contract and shell models, the introduction of retroactive indexing would cause a windfall transfer from employers/shareholders to any employee (including pensioners or those about to retire) who has past service credit under the terms of the plan. The larger the average interest rate assumption is over the period in which the pension benefit accrued, the larger this windfall gain will be according to the implicit contract model. Under the shell model, where the benefit is purely nominal, the difference between the current market rate and the real rate embodied in the indexing initiative will determine the size of the windfall gain. The key to this result is the fact that in competitive labour markets employees can never be paid less than the value of their marginal product.[7] Thus if today's active workers cannot be forced to accept a reduction in their compensation in order to free up funds for the employer to make indexing payments with respect to the past service of a potentially quite large group of retired former employees, there is a strong case for not requiring that indexing provisions be made retroactive. Unfortunately, if this is not done, little relief relative to that provided by the procedures employed currently will be provided pensioners and those about to retire under the terms of employer-sponsored plans.

---

[7] This windfall gain could be reduced, in the implicit contract model, if employers sought to recapture the

Note, finally, the perspective provided by this discussion on the debate concerning the proprietary rights to the excess or inflation-augmented earnings of the investment fund. Under the implicit contract model, they are to be shared between the employer and the employee. The larger the average interest rate assumption is over the period in which the employee's benefits accrued, the smaller the fraction is that belongs to him. Under the shell model, all such earnings belong to the employer/shareholder as the employee presumably received a current wage offset that reflected only the nominal value of the benefits provided under the terms of the plan. The employee, in addition, implicitly accepts the inflation risks attendant in the limitation of the employer's liability to a nominal pension benefit.

Employee Valuation of Pension Claims: Related Issues

The security of benefits in underfunded flat benefit plans.

As noted by the Task Force on Retirement Income Policy, the existence of large unfunded liabilities is confined largely to flat benefit plans. These plans provide a nominal benefit which is typically improved and extended to past service credits each time the union contract is renegotiated. The resulting amendments, typically designed to at least offset the impact of inflation which occurred since the prior contract was signed, are unfunded and may be amortized by special payments over a period of usually 15 years. The succession of plan amendments virtually guarantees that the plan will have large unfunded liabilities, especially in an inflationary climate. The question of the security of benefits in such plans, given the possibility of firm insolvency or plant shutdown, inevitably arises.

In Canada, as in the United States prior to the passage of the Employee Retirement Income Security Act

---

rents that would otherwise accrue to older workers by paying them only the value of their marginal product. See footnote 3.

(ERISA) of 1974, there is no plan termination insurance. Further, most employer-sponsored plans contain explicit provisions permitting the sponsor to terminate the plan, with the employer's obligation equal to the lesser of the vested benefits or the assets in the plan. Many observers[8] have argued, these legal provisions notwithstanding, that the implicit liability of the firm, so long as it is an ongoing concern, is to honour all vested pension claims. Even if this were the case, however, the possibility of firm insolvency would still link the existence of unfunded vested benefits to the real possibility that members of flat benefit plans may ultimately forfeit some fraction of their vested benefits.

The question of whether these large unfunded liabilities ought to be a concern to policy-makers is again linked ultimately to the employee valuation of pension claims. Loosely, the argument is as follows.[9] If workers or their representatives appropriately discount contractual pension claims in less well-funded plans (i.e., accepting a smaller reduction in current wages, given the improvements to the pension plan, than would be the case in better funded plans), then from the viewpoint of ensuring that workers receive the value of their marginal product there is no legitimate source of concern for policy-makers. (To the extent that paternalistic policy-makers are concerned with the workers' retirement incomes per se, this concern may be resurrected.) If, on the other hand, workers or their representatives treat contractual claims in less well-funded plans as if they were payable with certainty when making appropriate wage concessions, then the potential concern of policy-makers is clear. In this case, however, the real issue is the inappropriate or nonrational assessment by workers of the value of their pension claims in the context of compensation tradeoffs, not the existence of unfunded liabilities per se. Preliminary research on the state and local plans in the United States (which are not covered by ERISA) by Robert Inman of the University of Pennsylvania, as reported to the present author, provides mixed evidence on this issue. There is evidence, however, that at least some employee groups focus on the degree of plan funding per se in their negotiations, suggesting that discounting of claims does not occur in less well-funded plans. Again, this is an area of research which merits greater attention, especially in Canada.

---

[8] Jack Treynor, "The Principles of Corporate Pension Finance," Journal of Finance 32 (May 1977): 627-38.

[9] For a formalization of this argument, in the context of the optimal degree of pension funding from the viewpoint of the employer/shareholders, see Economics 3 (June 1976): 183-93.

If plan sponsors and their employees were required to use a real interest rate to value all benefits, both pre- and postretirement, then the degree of funding in flat benefit plans would dramatically improve. In effect, plans would be required to prefund the retroactive cost-of-living adjustments that typically occur with each round of collective bargaining. To the extent that retroactive plan amendments are designed primarily to offset the impact of inflation, the periodic creation of unfunded liabilities as the by-product of these amendments would largely disappear. Although this result may appear attractive to many policymakers, especially in the context of indexing reform in general, a number of caveats are in order. Under the present system, each plan amendment carries with it a well-defined intergenerational wealth transfer. The retroactive increases in plan benefits transfer wealth from young to older workers as part of an ongoing private social security system. The young workers accept this transfer in the expectation of receiving a corresponding transfer when they are old. To impose a different valuation and (thus) funding scheme would likely disrupt this ongoing scheme, again creating windfall redistributive effects. More generally, if present contracts with their frequent amendments provide union members with an efficient means of creating intergenerational wealth transfers, the appropriateness of interfering with this system is open to question. The issue, as noted at the beginning of this report, is the extent to which the paternalistic motivation for pension reform may conflict with the efficient contracts entered into by employers and their employees under the discipline of the marketplace.

Finally, the discussion of the extent to which employees do or do not discount vested benefits which are unfunded relates to another topical concern. There is much concern with the size of unfunded pension liabilities and the implications for aggregate share valuation. If a purely legalistic interpretation of the obligation of the plan sponsor is undertaken, and if it is remembered that the plan sponsor can terminate the plan and discharge his obligation at the lesser of funded or vested benefits, then unfunded liabilities do not represent a claim on shareholder wealth. If true, this implies that ceteris paribus there should be no correlation between the aggregate value of a firm's share and the size of any unfunded liability in the pension plan. This situation has its analogue in the correct discounting by the plan's members of benefits in light of their funded status, as noted previously. If there is an implicit commitment to plan continuation, such that an ongoing firm stands prepared to honour vested benefits regardless of the funded status of the plan, then unfunded (vested) liabilities are indeed true liabilities of the firm and thus ceteris paribus should exert a depressing impact on the aggregate value of the firm's share. To date, no careful assessment of this issue in Canada has taken place.

Inflation and benefit design in employer-sponsored pension plans. Throughout the 1970s, there has been a continued trend toward higher benefits (pension credit per year of service) as well as toward an improved earnings base. In 1965, for example, 65.4% of members of career average and final earnings plans were entitled to a basic credit of 2% of the relevant earnings base for each year of service. By 1978, this figure had risen to 75.4%.[10] Further, the percentage of members in final earnings plans rose from 50.9% to 58.7% of the total, while membership in career average plans declined from 24.1% to 14.3%. (Nonetheless, final earnings plans remained concentrated in the public sector: 95.8% of plan members in the public sector were in final earnings plans in 1978, compared to 29.8% of plan members in the private sector.) Similarly, crude calculations performed on these Statistics Canada data indicate that the mean benefit rate (monthly pension for each year of credited service) in flat benefit plans rose from $4.28 in 1970 to $10.56 in 1978, for a gain of 147%. This increase exceeds the 80.2% rise in the consumer price index which occurred in the same period.

On balance, there is reason to believe that the secular rise in the interest rate assumptions used to value plan benefits (Table 1) facilitated the apparent enrichment of benefit formulas. If plan sponsors and their employees had been encouraged to use a real interest rate, it is probable that at least some of these enrichments might not have taken place. The mandating of improved cost-of-living protection, whether through contractual or performance indexing, may prove palatable only if certain of these prior improvements can be undone. This rather awkward state of affairs draws attention again to the importance of the informed and well-disseminated valuation of pension benefits in the context of employee compensation.

Summary

1. Most occupational pension plans are being costed on the basis of valuation assumptions which exceed the real

---

[10] These and subsequent data are drawn from Statistics Canada, Pension Plans in Canada 1978, p. 34.

rate of interest. The implication is that the contribution rates so established can be realized only if the real value of pension benefits is eroded by inflation which occurs during the employee's retirement and, in most cases, in his active work years as well.

2. If mandatory indexing, whether contractual or performance, were introduced, each sponsor would value the benefits payable under the terms of his plan on the basis of the real interest rate embodied in the indexing initiative. The difference between the reported valuation assumption and the real interest rate would determine, given the benefit formula, the required increase in the contribution rate. The large variation in reported interest rate assumptions suggests that there would be substantial variation across plans in these required increases.

3. To the extent that the accruing value of pension benefits is increased by an indexing initiative, offsets will be required elsewhere in the worker's compensation package. Under the implicit contract model, the required increase in the contribution rate noted in (2) above would also measure the increase in the value to the worker of his accruing pension benefit. Under the shell model, in which workers value only the nominal benefit legally due under the terms of the pension formula, the increase in the value of accruing pension benefits would be greater, as would the required offset. This increase would reflect the difference between the prevailing nominal interest rate and the real interest rate in costing the benefit formula. This increase in value exceeds that under the contract model since reported valuation assumptions are universally less than the prevailing nominal rate of interest.

4. The required increases in contribution rates when postretirement or pre- and postretirement price indexing is introduced are illustrated for simplified final earnings, career average and flat benefit plans. The increases are calculated by replacing reported valuation assumptions by hypothetical real interest rates of 2% and 3%. The increases are particularly large for flat benefit and career average plans when pre- and postretirement indexing is introduced, as the erosion of the real value of accruing benefits which would occur in the absence of periodic plan amendments is halted. As discussed in (3), the increase in value to workers of accruing pension benefits should at least equal the calculated increases in these contribution rates.

5. If mandatory indexing is applied only to future service, the results cited in (2) and (3) will hold. If mandatory indexing is applied to past service, then large unfunded liabilities will be created. Income will be arbitrarily redistributed from employers/shareholders to those workers who have past service credits under the terms of the plan.

6. Because of periodic and retroactive amendments, flat benefit plans in the unionized private sector typically have large unfunded liabilities. It is not clear whether the members of such plans discount the promised benefits for the possibility that they might not be paid when these workers trade off current wages for improvements in the benefit formula. The use of a real interest rate to value accruing benefits would, in effect, prefund the nominal benefit improvements that typically occur. As a result, the degree of funding in such plans would increase substantially.

7. There is reason to believe that the gradual increase during the 1970s in the interest rates used to value plans, by ceteris paribus reducing projected costs, encouraged plan sponsors to enrich basic benefit formulas. The awkward fact is that partial retrenchment of these benefits may be required if indexing is introduced.

Policy Recommendations

Neither the auction nor the (illustrative) contract model is likely to have universal validity. As a result, there exists ambiguity regarding employee valuation of pension claims, and thus in the offsets required elsewhere in the compensation package, if an indexing initiative is introduced. In spite of this caveat, certain policy recommendations do follow from the preceding analysis.

1. If mandatory indexing of postretirement benefits is introduced, then workers must: (a) allocate a larger fraction of their lifetime earnings to pension benefits and/or (b) accept a scaling down of present benefit formulas. The possibility of (b), and perhaps actuarial guidelines to facilitate it, should be acknowledged by those advocating pension reform.

2. To the extent that the implicit contract model is valid, and hence that employer contributions per se indicate the value to employees of accruing pension benefits, the sharp differences in reported valuation assumptions (and hence contribution rates) merit note. In the context of

(1) above, the necessary scaling down in pension benefit formulas to maintain contribution rates at, say, their present levels will vary sharply across firms. This problem, too, should be acknowledged by those advocating reform.

3. Mandatory indexing of postretirement benefits, if introduced, should apply only to future service. To extend mandatory indexing to past service credits would arbitrarily redistribute wealth from employers/shareholders to employees who have past service under the terms of the plan.[11] Policy-makers might encourage plan sponsors to offset an actuarially based scaling down of past service credits in return for a retroactive extension of the indexing initiative. Employees could then choose whether or not to extend indexing to their prior service under the revised terms of the plan.

4. Because of the prevalence of both ad hoc amendments to career average plans and negotiated, retroactive amendments to flat benefit plans, the erosion of the real value of pension benefits as they accrue during the employee's active work years is not so major a problem as it might at first appear. Nonetheless, if (price) indexing is also extended to the preretirement period, so as to preserve contractually the real value of accruing benefits, required contribution rates for flat benefit and career average plans could rise dramatically.

---

[11] The analysis in the text is premised on the rational behaviour of both employers and employees in competitive labour markets. If nonrational behaviour, say, on the part of employees were entertained as a possibility, then certain of the preceding conclusions could be overturned. Suppose, for example, that in spite of the absence of formal indexing pensions, employees -- but not their employers -- valued pension benefits as if they were defined in real terms. The implication is that employees value their benefits as if they were capitalized with a real interest rate. Employers, for their part, are presumed to make no such error. Thus a gap exists between the benefits as legally due (and costed by the employer) and the benefits as valued by the employee. Under these circumstances, two prior conclusions would be reversed. First, the incidence of the increased costs associated with indexing future service credits would fall on the employer, as employees would now receive the full value of their marginal product. Second, extending indexing to past service credits would simply undo the unintended transfer of wealth from employees to employers that had occurred in previous periods.

Again, the possibility of retrenchment in other pension benefits, together with the windfall gains created if the initiative is extended to past service credits, should be acknowledged by those advocating reform.

5. Requiring sponsors, and thus the employees, of flat benefit plans in particular to value accruing benefits on the basis of a real interest rate, regardless of its other merits, would be an effective means of enhancing the security of the benefits payable under the terms of such plans. This initiative could preempt the need for the introduction of plan termination insurance, which is being discussed in response to recent, or threatened, plant shutdowns.

PART II

UNCERTAINTY REGARDING INCOME REPLACEMENT IN MONEY PURCHASE PENSION PLANS: EVIDENCE AND INTERPRETATION

Introduction: The Issues

At present, the vast majority of members of occupational pension plans in Canada are in defined benefit plans. In 1978, 93.6% of plan members were in defined benefit plans, while only 4.8% were in money purchase or defined contribution plans.[1] Further, the majority of members of money purchase plans were in small plans, as is evident from the fact that 43.2% of occupational pension plans in 1978 were money purchase plans. Money purchase plans are thus concentrated among small firms, where either administrative costs or the probability of firm insolvency mitigates against the use of a defined benefit formula. In short, firms and their employees would appear to have a preference for the defined benefit formula, which may be regarded, at least tentatively, as the market solution to the problem of optimal pension arrangements.

In spite of this fact, many now advocate an exanded role for money purchase plans within the occupational pension system. The centerpiece of the recommendations put forward by the Royal Commission on the Status of Pensions in Ontario is a universal money purchase plan, the Provincial Universal Retirement System (PURS). Both the employer and the employee would make predetermined contributions to PURS on behalf of the employee. The employee would determine how the accumulated funds are invested, just as he would with an RRSP. Manitoba has recently proposed the introduction of a (more modest) voluntary employer pension plan (VEPP), which would also be of the money purchase variety. Further, most proposals for the reform of the private pension system call for the expanded use of locked-in RRSPs as a means of improving the effective portability of pension benefits.

Those who advocate an expanded role for money purchase plans draw attention to a now standard list of the limitations of defined benefit plans. Benefit accruals are quite small for young employees; the plans may be underfunded and the security of the promised benefits may occasionally be placed in jeopardy; the portability of pension credits or years of pensionable service is difficult to achieve; only final earnings plans preserve, on a contractual basis, the real value of benefits as they accrue during the member's active work years; and all defined benefit plans, in the absence of some form of contractual cost-of-living adjustments, expose the pensions ultimately provided to erosion by inflation during the member's retirement years. By contrast, money purchase plans are age neutral, fully funded by definition, vest immediately, are fully portable and, because nominal interest rates compensate the investor for anticipated inflation, preserve the real value of the member's benefit from anticipated inflation during both the active work and the retirement years.

---

[1] Statistics Canada, Pension Plans in Canada 1978, cat. no. 74-401 (Ottawa: Supply and Services Canada, 1979), p. 30. The remaining 1.6% of plan members were in profit sharing or composite plans.

Those who advocate an expanded role for money purchase plans may be discomforted by the apparent preference of workers for defined benefit plans. To some, the simple response is that defined benefit plans are not well suited to today's inflationary environment. More substantively, as evidenced by the willingness of most large employers to grant ad hoc cost-of-living adjustments to pensions in pay,[2] the distinction between defined benefit and money purchase plans may have become blurred. To the extent that firms use excess investment earnings (i.e., investment earnings above the assumed valuation rate) to enrich either pensions in pay or the nominal benefit formula (for example, in career average plans), the plan member, as distinct from the shareholder, has the proprietary interest in the performance of the pension fund. To some extent, there has been a metamorphosis of the defined benefit plan into a defined benefit/money purchase hybrid.

In spite of the above observation, which has important implications, most advocates of the expanded use of money purchase plans do not emphasize the fact that the plan member bears all of the investment risk under this type of plan design. The Royal Commission, for example, does not address the problem of investment risk,[3] and the supporting research studies simply avoid the problem by assuming a constant real interest rate in the simulation exercises.[4] In general, uncertainty regarding the fraction of preretirement income that would be replaced under a money purchase plan with a fixed contribution rate is a neglected aspect of the policy debate regarding the provision of retirement incomes. The fact that the plan member assumes all of the investment risk has caused at least some observers to summarily dismiss the recommendation that money purchase plans be encouraged as a matter of public policy. The fact that "like employees with like contributions" might have substantially different pensions, depending upon their fund's performance, is frequently cited as an additional reason why money purchase plans are not to be encouraged.

---

[2] See, for example, the data summarized in Task Force on Retirement Income Policy, The Retirement Income System in Canada: Problems and Alternative Policies for Reform (Hull, Que.: Supply and Services Canada, 1980) vol. I, especially pp. 49-50.

[3] The Royal Commission on the Status of Pensions in Ontario (Report [Toronto: Government of Ontario, 1981], vol. II, p. 263) refers to the "single disadvantage" of money purchase plans, which is the inability to provide past service credits. As a result, these plans take considerable time to mature and thus to begin to deliver significant retirement incomes.

The purpose of Part II of this report is twofold. First, through stochastic simulation, Part II seeks to establish the degree of uncertainty regarding the income replacement rates in a money purchase plan with a fixed contribution rate. These exercises highlight the characteristics of the risk-return trade-offs for alternative investment portfolios and are of independent interest in view, for example, of the expanding role of RRSPs in Canada's retirement income system.[5] Second, Part II seeks to interpret these results in light of: (1) the risks to which members of defined benefit plans are exposed, (2) the role of compensating wage differentials when employers/shareholders do assume investment risk in defined benefit plans and (3) the apparent metamorphosis of defined benefit plans into defined benefit/money purchase hybrids. Both objectives are designed to shed light on the ultimate issue of whether money purchase plans ought to be encouraged as a matter of public policy.

Historical Data on the Real Returns to Alternative Assets

Annual data on the real returns to 91-day Treasury Bills, long-term Government of Canada bonds, common stocks, provincial bonds, corporate bonds and conventional mortgages

---

[4] Y. Balcer and I. Shain, "A Study of Private Pensions in Ontario," in Royal Commission, Report, vol. VIII, p. 158 use assumed real returns of 2.4%, 2.6% and 2.4% in the periods 1980-84, 1985-89, and 1990 and beyond in their simulation exercises. No allowance is made for the uncertainty of these real returns.

[5] By 1976, the latest year for which detailed data are available, 10.5% of the over 12 million persons who filed income tax returns reported RRSP contributions.

Table 4

Real Rates of Return (Per Cent per Year) on Alternative Assets: 1953-1980

Year	(1) 91-day Treasury Bills	(2) Long-term Canada bonds	(3) Common stocks	(4) Provincial bonds	(5) Corporate bonds	(6) Conventional mortgages	(7) Inflation (CPI)
1953	1.71	3.61	2.72	5.12	3.84	4.76	0.0
1954	0.83	9.20	38.46	23.74	9.66	5.82	0.60
1955	1.32	-0.61	17.32	-2.87	1.89	5.85	0.30
1956	-0.17	-6.45	8.90	-12.50	-10.49	0.45	3.10
1957	1.58	4.08	-22.37	7.71	4.98	3.41	2.15
1958	-0.26	-8.17	28.16	-3.84	0.51	4.82	2.52
1959	3.39	-5.84	3.04	-6.32	-5.61	3.86	1.37
1960	1.83	5.56	0.33	9.36	10.36	6.66	1.35
1961	2.68	9.48	32.41	9.05	8.55	6.86	0.13
1962	2.42	1.42	-8.70	2.85	3.14	5.33	1.59
1963	1.70	2.66	13.50	2.58	3.38	5.08	1.83
1964	1.79	4.48	22.96	4.82	2.54	4.97	1.93
1965	1.05	-1.87	3.57	-2.59	-3.39	2.68	2.90
1966	1.39	-1.92	-10.28	-4.79	-5.03	1.96	3.55
1967	0.48	-5.99	13.32	-3.68	-4.26	1.86	4.14
1968	2.09	-4.37	17.53	-2.48	-1.75	2.46	4.09
1969	2.50	-6.47	-5.29	-7.06	-5.46	0.12	4.58
1970	4.46	19.67	-5.01	15.93	11.63	9.96	1.46
1971	-1.41	5.98	2.84	7.47	8.65	8.14	5.04
1972	-1.46	-3.76	21.14	1.13	3.77	3.44	5.09
1973	-3.34	-6.78	-8.70	-7.41	-6.12	-2.23	9.12
1974	-4.13	-12.48	-34.76	-13.40	-16.28	-7.20	12.46
1975	-1.91	-6.09	9.31	-2.18	-1.21	2.16	9.48
1976	2.88	11.99	4.82	13.25	14.37	7.54	5.82
1977	-1.98	-3.32	0.43	-0.86	1.20	4.32	9.50
1978	0.23	-6.56	19.25	-4.14	-3.38	-1.64	8.43
1979	1.76	-11.14	31.64	10.47	-10.65	-3.87	9.76
1980	1.42	-8.22	16.83	-7.45	-8.29	-2.99	11.21
Mean	0.82	-0.78	7.97	-0.01	0.23	3.02	4.41
Standard deviation	2.02	7.60	17.02	7.89	7.46	3.93	3.6
Correlation coefficients							
(1) Bills	--	.526	.216	.440	.402	.486	-.623
(2) Canadas		--	.048	.946	.893	.836	-.599
(3) Stocks			--	.115	.202	.212	-.226
(4) Provincials				--	.964	.840	-.542
(5) Corporates					--	.902	-.565
(6) Mortgages						--	-.740
(7) Inflation							--

Notes: Data are drawn from C.G. Carlton, D.D. Ezra and K.P. Sharp, "Canadian Investment Returns and Other Economic Statistics, 1926-1980" (mimeo., n.d.), where details regarding the calculation of the individual series may be found. For purposes of calculating the nominal returns, mortgages are treated as five-year bonds. The annual return on Treasury Bills is obtained by the successive purchase of 91-day Treasury Bills at the end of each quarter. No default experience is reflected in the corporate bond and residential mortgage returns, so that these returns represent upper bounds relative to those on default-free Treasury Bills and long-term Canada bonds.

for the period 1953-1980 are presented in Table 4. The means, standard deviations and correlation coefficients are also presented, as is the annual rate of inflation as measured by the consumer price index. Because these data and their interpretation are of interest independent of their role in the simulation exercises, their central characteristics are reviewed briefly below.

Note first that the sample period was chosen to avoid periods of deflation, which occurred last in Canada in 1952. Because nominal interest rates are bounded below by zero (and must generally exceed zero in the presence of positive transactions costs), the ability of nominal interest rates to embody an appropriate inflation premium is not symmetric with respect to periods of anticipated inflation and anticipated deflation. To include periods of deflation in the calculation of descriptive statistics such as the mean and standard deviation of, say, Treasury Bills is potentially quite misleading.[6]

Note that the real returns on all the alternative assets are negatively correlated with inflation, at least in the 1953-1980 period. This result mirrors the concern that traditional pension plan assets may not provide an adequate hedge against inflation. Stocks have the smallest (in absolute value) correlation with inflation, yet their high standard deviation indicates their inherent degree of business risk. The minimum variance portfolio, in the absence of short selling, is a portfolio invested entirely in Treasury Bills, which would yield an expected real return of somewhat less than 1%. There is no attempt to isolate the impact of anticipated as distinct from unanticipated inflation on real returns. The data as presented presume that the market prices the alternative assets to yield equilibrium ex ante real returns, and that unanticipated inflation is simply one of a myriad of sources of new information which can cause realized returns to depart from ex ante returns. For fixed-income securities, especially if unanticipated inflation conveys information regarding the permanent or long-run rate of inflation, this particular source of new information is, of course, likely to be of paramount importance.

Note that the realized real returns on long-term Canada, provincial and corporate bonds are depressed, and in two cases negative, during the 1953-1980 period. This result is not surprising in view of: (1) the almost secular increase in the rate of inflation, which suggests that a significant amount of the observed inflation was unanticipated and (2) the depressing impact on the real returns on long-term, fixed-income securities of unanticipated, permanent inflation. For purposes of simulation, these depressed real returns are clearly unrealistic. As noted in the footnotes to Table 5, real returns of 2.0%, 2.75% and 3.0% are used for the Canada, the provincial and the corporate bonds, respectively. Data on standard deviations and correlation coefficients remain fixed at their historical values.

---

[6] In 1931, for example, prices as measured by the consumer price index fell by 10.21% and the real return on Treasury Bills was 12.91%. (See Carlton, Ezra and Sharp, "Canadian Investment Returns.") The result of including this particular year of deflation would be to significantly increase both the estimated mean and standard deviation of the real return on Treasury Bills.

The stochastic simulations depend crucially on the assumed means, standard deviations and correlation coefficients of the assets which comprise the alternative pension plan portfolios. The use of historical data (subject to the caveat above) to provide these inputs is the only practical alternative. If, say, the risk premium accorded common stocks has increased, as some observers maintain,[7] the real return employed in these simulations will be too low. To build this type of adjustment into the simulation exercise, although not difficult, would be entirely speculative. On balance, there is no reason to believe that the use of the historical data will not be adequate for the purpose at hand. Note, finally, that the historical data refer to the realized, before-tax real rates of return on the alternative assets. Since savings accumulates within a tax-sheltered pension plan on a before-tax basis, no explicit attention to the role of tax factors is required.

The Simulation Experiments: Design

The simulation experiments assume that a fixed percentage (the contribution rate) of the employee's salary during each year of his active work life is contributed to a money purchase plan. At age 65, the employee retires and uses the accumulated funds in the plan to purchase a life annuity. For simplicity, the employee is assumed to live, with certainty, for 16 years after retirement. He is able to purchase an annuity at an interest rate of 2.5%. This rate, which approximates the real return on a conservatively managed portfolio of fixed-income securities, is designed to ensure that the calculated replacement rates are real replacement rates (i.e., the ratio of a real or constant dollar pension benefit to preretirement earnings). The implications of using a higher nominal rate to value the annuity are discussed later in this report. The contribution rate is fixed at 3.5% of salary. This is the rate (approximately) suggested by the Royal Commission on the Status of Pensions in Ontario for PURS.[8] As noted in the footnotes to Table 5, the adjustment to the indicated replacement rates for an alternative contribution rate is strictly proportional.

---

[7] See, for example, B. Malkial, "The Case for Common Stocks in the 1980s," in A.R. Sanderson, DRI Readings in Macroeconomics (New York: McGraw-Hill, 1980), pp. 128-36. He argues that increased uncertainty has caused the risk premium accorded common stocks to increase, a result which also helps explain the deterioration in price-earnings ratios throughout the 1970s.

The simulation exercise begins with the choice of a particular investment strategy. If the decision is made, say, to hold only common stocks, then the mean and standard deviation of common stocks are specified. On the assumptions that the returns are: (1) normally distributed and (2) serially uncorrelated, the return on the portfolio in any period is obtained by drawing at random from a normal distribution whose mean and variance are those assumed to characterize the distribution of real returns on common stocks. The experiment proceeds as follows. At the beginning of the first year, the member contributes (or has contributed on his behalf) 3.5% of his initial salary to a money purchase plan. If he decides to hold only common stocks, the return that the fund earns is generated by the procedure described above. At the beginning of the second year, he contributes 3.5% of his then-current salary to the plan. This contribution, when added to the value of the plan's assets at the beginning of the second year, constitutes the fund which earns the real return in year two. This real return is determined by a second drawing from the assumed normal distribution. The process is then repeated for each year that the employee works. Since both the returns to the plan's assets and the assumed salary path are specified in real terms, the rate of inflation appears nowhere in the analysis. As discussed later, the rate of inflation is resurrected only if a nominal interest rate is used in the annuity calculation, which has the effect of transforming the pension from a real to a nominal benefit.

---

[8] Specifically, the Royal Commission proposed that employers contribute 2% of salary (between the year's basic exemption [YBE] and the year's maximum pensionable earnings [YMPE] established for the CPP), while workers contribute 1% while aged 18 to 30, 1.5% while aged 31 to 45 and 2% while aged 46 to 65. The target replacement rate for PURS would be about 20% of preretirement earnings. This target rate is not comparable to the rates presented in the tables in Part II of this report because the Royal Commission appears to have used an interest rate in excess of 6.4% in its annuity calculations. As a result, the income replaced under the Commission's assumptions is implicitly a cross between a real and a nominal rate.

The assumption that the real returns to each asset are both normally distributed and serially uncorrelated merits further comment. The three key assets in the simulation exercises are Treasury Bills, common stocks and long-term bonds. Tests for the normality of the returns on the Treasury Bills, common stocks and the Government of Canada bonds indicated in each case that the null hypothesis of a normal distribution could not be rejected.[9] The real returns on Treasury Bills, unlike those on common stocks and the Canada bonds, exhibited significant (positive) serial correlation.[10] This latter point merits additional comment.

As noted, the minimum variance portfolio (in the absence of short selling) is a portfolio invested exclusively in bills. For simplicity, the assumption of serial independence of the return on bills is retained in the main body of the simulation exercises. It must be noted, however, that the serial correlation which in fact exists in the bill returns will cause these exercises to understate the variance of terminal wealth in a bills-only portfolio and thus

---

9. The studentized range equalled 4.30, 3.98 and 4.25 for the stocks, bonds and bills, respectively. The 10% significance level for the sample size reported here is 4.70, so that the null hypothesis of normality could not be rejected. See E.F. Fama, Foundations in Science (New York: Basic Books, 1976), especially chap. I, for a discussion of the studentized range in the present context.

10. For Treasury Bills, the real return (x_t) is estimated to behave as follows:

$$\underset{}{x_t} = \underset{(1.17)}{.004680} + \underset{(2.17)}{.3968}\ x_{t-1}$$

The figures in parentheses are t-statistics, and the standard error of the regression is 0.01921.

in the calculated replacement rates.[11] For this reason, an additional simulation which incorporates the serial correlation in bill returns is reported in the discussion.

The Simulation Experiments: Results

Consider first the results presented in Table 5. The worker makes contributions equal to 2.5% of his salary from age 20 to 64 (i.e. for 45 years), and his salary grows at 2% per year. The median replacement rate (i.e., the ratio of the pension to preretirement earnings) and related summary statistics for 25 stochastic simulations are presented for four alternative portfolios: common stocks, Treasury Bills, a portfolio approximating the aggregate portfolio of trusteed pension plans in private industry and a portfolio approximating the aggregate portfolio of all trusteed pension plans in Canada. For common stocks, a second or pessimistic simulation is conducted which embodies the less favourable risk-return characteristics of the subperiod 1967-1980. Detailed notes regarding all assumptions are contained in the table.

Although Table 5 is self-explanatory, a number of observations merit emphasis. As noted, a portfolio made

---

[11] To see the point, consider the following simplified example. Suppose that the real rate of return on the first asset is described by (1) $\ln(1+r_t) \equiv x_t = x_{t-1} + e_t$ where e_t is serially uncorrelated and normally distributed, with expectation zero and variance σ_e^2. The (lognormal) return thus follows a random walk and has a serial correlation parameter equal to one. Let the real rate of return on the second asset be described by (2) $\ln(1+r_t) \equiv z_t = k + u_t$ where u_t has properties analogous to e_t. Let W_N be the terminal wealth resulting from buying one dollar of the asset at the beginning of the first year and reinvesting the proceeds for N years. Even if σ_u^2 is much greater than σ_e^2, so that the one-period variance of the return on the second asset greatly exceeds that on the first, the variance of $\ln W_N$ will -- for large enough N -- be greater for the first asset. As the variance of $\ln W_N$ increases, so does the variance of the replacement rates in the simulation exercises described in the text. Although, unlike the first asset, real bill returns do not follow a random walk, they do have substantial serial correlation which produces an analogous effect.

Table 5

Income Replacement Rates Under Alternative Investment Strategies: Simulation Results
(25 Trials)

Replacement rate (3.5% contribution rate)[a]	Investment Portfolio				
	Common Stocks				
	Historical[b]	Pessimistic[c]	Treasury Bills	Fund One[d]	Fund Two[e]
Median (%)	37.0	21.9	9.2	17.8	16.4
Range	11.6 to 161.4	7.5 to 90.2	8.2 to 10.7	11.5 to 30.5	10.9 to 27.
3rd highest	114.9	65.7	10.3	26.8	24.0
3rd lowest	13.5	8.9	8.3	12.2	11.5

[a] If the contribution rate were 1.0% of salary, then each replacement rate would equal 1.0 ÷ 3.5 or .2857 times the replacement rate reported above.

[b] Historical simulation assumes a mean (real) return of 7.97% per annum and a standard deviation of 17.02% per annum, based on the sample period 1953-1980.

[c] Pessimistic simulation assumes a mean (real) return of 5.95% per annum and a standard deviation of 16.51% per annum, based on the subperiod 1967-1980.

[d] Fund One is a proxy for the aggregate portfolio of trusteed pension plans in private industry as of 31 December 1979. Fund One consists of common stocks (29.0%), mortgages (16.1%), Government of Canada bonds (12.9%); provincial-municipal bonds (9.6%), corporate bonds (17.4%) and liquid assets/Treasury Bills (15.0%).

[e] Fund two is a proxy for the aggregate portfolio of all trusteed pension plans in Canada as of 31 December, 1979. Fund Two consists of common stocks (20.6%), mortgages (13.8%), Government of Canada bonds (9.9%), provincial-municipal bonds (31.1%), corporate bonds (13.4%) and liquid assets/Treasury Bills (11.2%).

Assumptions: Real salary growth is 2% per year; contributions are made from age 20 to age 64 (45 years); life expectancy is 16 years at retirement; annuity is purchased at an interest rate of 2.5%. Means, variances and correlation coefficients are those reported in Table 4, except that the means of the Canada, the provincial and the corporate bonds have been raised by 278, 276 and 277 basis points to equal 2.0%, 2.75% and 3.0%, respectively.

up exclusively of bills constitutes the minimum variance portfolio in the assumed absence of short selling. The narrow range in income replacement rates, from 8.2% to 10.7% of preretirement earnings, together with the low median replacement rate of 9.2%, thus illustrate how the risk-return characteristics of bills as a one-period investment translate into analogous characteristics regarding income replacement rates. (Remember that the annuities are purchased at a 2.5% interest rate, which is roughly consistent with the pension benefits being preserved in real terms. This fact is crucial in interpreting all of the calculated replacement rates.) For stocks, based on the historical simulation, the median replacement rate of 37.0% is much higher, as is the range of 11.6% to 161.4%. Indeed, the reported ranges do not overlap, suggesting that common stocks dominate bills as a long-term investment. Although this observation merits qualification since a larger number of trials would eventually produce an overlap in these ranges, the basic point remains. If historical data are an adequate guide to future performance, stocks would appear to dominate bills as a long-run investment. The substantial variance in one-period returns also suggests that there would be substantial uncertainty regarding the income that would ultimately be replaced if all funds in the money purchase plan were invested in common stocks. Even in the pessimistic simulation, common stocks promote a much higher median replacement rate, with little likelihood that the worst outcome for stocks will be significantly lower than the worst outcome for bills. The above contrast merits increased emphasis when it is recognized that deposits at financial intermediaries, which are held in many RRSPs, have a lower expected return than do Treasury Bills.[12]

Consider, finally, the replacement rates under the two diversified portfolios which are broadly representative of trusteed pension plans. The median replacement rates are much higher than for the bills-only portfolio, although the uncertainty regarding these replacement rates is also higher. Again, the results are best viewed as depicting the translation of traditional risk-return trade-offs on one-period rates of return into analogous risk-return trade-offs for terminal wealth and, ultimately, for the pensions purchased by the accumulated wealth.

---

[12] During the period 1978-1980, for example, the rate on nonchequable deposits at the chartered banks averaged about 150 basis points (i.e., 1.5%) less than the return on 91-day bills. Rates on nonchequable deposits at trust companies may average 25 to 50 basis points higher than rates paid by the chartered banks. The nonchequable deposit and bill rates do move in tandem, however, indicating that the variances in the returns so produced are approximately equal.

The simulations reported in Table 6 illustrate the impact of the length of the contribution period (i.e., the number of years in which the worker or the employer on the worker's behalf contributes to the money purchase plan) on the income replacement rates for the portfolios examined in Table 5. The major point to note is that the dominance of risky assets (stocks) over less risky assets (bills) is less clear, the shorter the contribution period. For the 15-year contribution period, the worst outcome for stocks is inferior to the worst outcome for bills, unlike the 45-year period examined in Table 5. Since these results are self-explanatory, no further treatment is accorded them in the text.

These results do, however, provide a useful background against which to raise the question of the sensitivity of the bill results to the assumption that bill returns are not serially correlated. When the serial correlation noted in footnote 10 is built into the simulation exercises,[13] the degree of uncertainty regarding the income replacement rate increases. This result, which is expected (see footnote 11), can be seen by comparing the revised results for the 15-year and 45-year contribution periods to those reported in Table 6. For the 45-year period, the range of replacement rates is now 4.3% to 19.1%, which is considerably greater than the previous range of 8.2% to 10.7%. For the 15-year period, the range is now 2.4% to 5.9%, rather than 3.3% to 4.0%. The median replacement rates for the 15-year and 45-year contribution periods are 3.4% and 8.6% in the serial correlation simulation, or slightly less than in the previous simulations. In short, the simulations reported in Table 6 are likely to understate the degree of uncertainty in the income replaced through a bills-only portfolio because they ignore the positive serial correlation in real bill returns. By implication, the attractiveness of a bills-only portfolio -- or term deposits at trust companies and other similar investments -- is overstated.

In Table 7, the sensitivity of the calculated replacement rates to the salary growth assumption is examined. The reported figures assume a zero (real) growth rate in sala-

---

[13] The equation reported in footnote 10, together with the initial condition that the bill rate is at its historical mean of 82 basis points, is used to generate the stochastic returns on bills in this additional simulation.

Table 6

Income Replacement Rates: Alternative Contribution Periods

	Investment portfolio				
	Common stocks				
Replacement rate (3.5% contribution rate)	Historical	Pessimistic	Treasury Bills	Fund One	Fund Two
45 years					
Median (%)	37.0	21.9	9.2	17.8	16.4
Range	11.6 to 161.4	7.5 to 90.2	8.2 to 10.7	11.5 to 30.5	10.9 to 27.2
3rd highest	114.9	65.7	10.3	26.8	24.0
3rd lowest	13.5	8.9	8.3	12.2	11.5
35 years					
Median (%)	21.9	14.7	7.5	12.5	11.7
Range	7.9 to 65.7	5.6 to 43.7	6.7 to 8.6	8.5 to 19.5	8.2 to 17.9
3rd highest	45.5	30.7	8.3	17.3	16.0
3rd lowest	9.8	7.3	7.0	9.4	9.0
25 years					
Median (%)	11.3	8.7	5.7	8.1	7.7
Range	4.3 to 20.4	3.5 to 15.5	5.1 to 6.1	5.5 to 10.2	5.4 to 9.7
3rd highest	17.3	12.5	5.9	9.3	8.9
3rd lowest	6.1	4.8	5.3	6.3	6.1
15 years					
Median (%)	5.3	4.6	3.6	4.5	4.3
Range	2.7 to 12.9	2.4 to 10.6	3.3 to 4.0	3.4 to 6.2	3.4 to 5.9
3rd highest	7.4	6.3	3.8	5.0	4.9
3rd lowest	2.9	2.5	3.4	3.6	3.7

See Table 5.

ries, compared to the 2% assumed in the previous tables. The obvious result is that ceteris paribus the higher the (real) growth rate of salary (or the steeper the age-earnings profile), the lower will be the replacement rate. For bills, for example, the median replacement rate rises from 9.2% to 14.4%, or by more than 50%. These results reflect the fact that preretirement earnings are higher if the assumed growth rate is higher, thus reducing the replacement rate corresponding to any fixed stream of pension payments. Although the 3.5% contribution rate is applied to higher lifetime earnings if the salary growth assumption is increased, so that both terminal wealth and the annuities so purchased increase, the annuities do not rise sufficiently to prevent a decline in the ratio of pension income to preretirement earnings. Since this result is obvious from comparing the zero growth and 2% salary growth cases, there is no reason to refine the illustration by postulating more complicated age-earnings profiles.

In Table 8, the impact of altering the interest rates used to cost (purchase) the annuities is illustrated. Obviously, as the annuity interest rate rises, the replacement rate increases. This result occurs, quite simply, because the size of the annuity that can be purchased for a given capital sum increases as the annuity interest rate rises. A change in the annuity rate from 2.5% to 7.5%, for example, increases the median replacement rate for the bills-only portfolio from 9.2% to 13.2%, which represents an increase of 50%. Mechanically the impact of altering the annuity rate assumption is quite apparent. The economic implications, including the implicit role of inflation, merit elaboration.

Note first that the minimum variance portfolio is the bills-only portfolio, which would yield an expected real return of slightly less than 1%. A potential retiree who wanted to ensure that the stream of pension payments most closely resembled a real payments stream would buy a variable annuity[14] at an interest rate of about 1% and hold on-

---

[14] For a discussion of variable annuities, see Dan M. McGill, Fundamentals of Private Pensions (Homewood, Ill.: Richard D. Irwin, 1979), pp. 212-15. Let v be the interest rate used to determine the annuity payments that can be purchased with an initial sum of capital. Then, for each year t, the pension benefit will equal $(1 + r_t)/(1 + v)$ times the benefit paid in year t - 1. If the rate of return (r_t) earned in period t exceeds the assumed valuation rate the benefit is increased, and if the rate of return is below the valuation rate the benefit is decreased.

Table 7

Income Replacement Rates Under Alternative Investment Strategies: No Salary Growth

	Investment portfolio				
	Common stocks				
Replacement rate (3.5% contribution rate)	Historical	Pessimistic	Treasury Bills	Fund One	Fund Two
Median (%)	67.3	38.4	14.4	30.4	27.8
Range	20.1 to 304.8	12.1 to 164.9	12.6 to 16.9	19.2 to 53.8	18.0 to 47.5
3rd highest	213.7	117.8	16.3	47.5	42.1
3rd lowest	23.1	14.1	12.8	19.8	18.6

Notes and Assumptions: See Table 5 (except for real salary growth).

Table 8

Income Replacement Rates with Nominal Interest Rate in Annuity Calculation

	Median replacement rate (%)				
	Common stocks				
Annuity interest rate (%)	Historical	Pessimistic	Treasury Bills	Fund One	Fund Two
1.0	32.8	19.4	8.2	15.8	14.6
2.5	37.0	21.9	9.2	17.8	16.4
5.0	44.5	31.0	11.2	21.5	19.9
7.5	52.8	31.2	13.2	25.9	23.5
10.0	61.7	36.5	15.4	29.7	27.4
12.5	71.1	42.1	17.8	34.3	31.7

Notes and Assumptions: See Table 5 (except for annuity interest rates).

ly bills. If an insurance company were willing to assume the relatively modest investment risk implied by a bills-only portfolio, the insurance company could sell fully indexed (i.e., real) annuities at an interest rate of somewhat less than 1%. From this perspective, the use of a 1% assumption might best approximate the real replacement rate (i.e., the ratio of a real or constant dollar benefit to preretirement earnings) that could be obtained under the alternative portfolios. Regardless of the portfolio chosen during the accumulation or contribution period, the plan member would choose to invest the accumulated funds at the date of his retirement in bills only, either directly in the case of a variable annuity or indirectly in the case of an indexed annuity sold by a life insurance company seeking to minimize its own risk exposure. The use of the 2.5% annuity rate in the main body of simulation experiments thus represents somewhat of a departure from the real replacement rate concept. On the other hand, as illustrated by the Task Force,[15] the use of excess investment earnings over, say, 2.5% on a portfolio of short-term debt instruments is likely to provide a very high degree of cost-of-living protection.

Consider now the implications of using a somewhat higher annuity rate assumption. For purposes of illustration, assume that a bills-only portfolio provides a real return of 1% with certainty. Assume that the anticipated rate of inflation is 6.5% and that, correspondingly, nominal bill yields are 7.5%. If this 7.5% rate is used to value the annuity, then the pension so acquired is implicitly expected to decline in real terms at a rate of 6.5% per year. In this case, the replacement rate so calculated is purely nominal. Its value, in turn, conveys little useful information unless the anticipated rate of inflation is also specified. For higher inflation rates, nominal or market bill yields would be higher. If these higher rates were used to value the annuity in the present example, the calculated replacement rates would rise in tandem with the interest rate assumption, as would the expected rate of decline in the real value of the pension due to inflation. This example illustrates why the use of arbitrarily high interest rates in the annuity calculation is potentially misleading and ultimately not very useful. Because nominal interest rates move in tandem with inflation, and since forecasts of the inflation rate (and hence the level of nominal interest rates) in the distant future are so speculative, their use in annuity calculations has little merit. It is more useful to focus the simulation experiments on real replacement rates, both because plan members are presumably interested in the real value of their pension benefits, and because the resulting calculations require no assumption about the highly uncertain future rate of inflation.

---

[15] Task Force, Retirement Income System, vol. I, p. 230.

Analysis of the choice of an annuity rate assumption in the case in which the funds are invested in risky assets is also straightforward. If the funds are invested only in stocks, the expected real return would equal approximately 8%. The use of this rate to value the annuity would thus be consistent with the claim that the replacement rate so calculated is a real replacement rate (i.e., it is expected that the real value of the benefit will remain constant). If the retiree were to purchase a variable annuity at an interest rate of 8%, and to hold only stocks, he would expect the real stream of annuity payments to remain constant. Because of the large variance in stock returns, however, the real income stream would in fact be highly risky, a situation which the plan member may find unattractive. From an alternative perspective, it is quite unlikely that a life insurance company would be willing to underwrite an indexed annuity at 8% by investing solely in common stocks. The shareholders of the life insurance company would demand very large compensation for assuming this investment risk. Indeed, if bills did yield a real return of 1% with certainty, the life company would only have to offer a yield of 1% on a fully indexed annuity. If the life company wanted to invest only in stocks, then the difference in the expected real returns of 7% (i.e., 8% on stocks less 1% on bills) is the market-determined compensation that shareholders of the life insurance company would require to compensate them for assuming the investment risk inherent in the stocks-only portfolio.

To sum up, it would appear to be appropriate to use an annuity rate assumption of not more than, say, 2.5% if the intention is to value a benefit which is both real and relatively certain. A retiring plan member could purchase a variable annuity backed by a risky portfolio in order to earn a higher (expected) real return, but the resulting income stream would be very uncertain.

The major conclusions drawn from the simulation exercises are as follows:

1. For all investment portfolios, including Treasury Bills when their positive serial correlation is acknowledged, there is substantial uncertainty regarding the ratio of pension income to preretirement earnings (the income replacement rate) for a money purchase plan with a fixed contribution rate. This result reflects the fact that the plan member bears all of the investment risk,

together with the uncertainty regarding the real returns on alternative plan assets.

2. The stochastic simulations reported in the text translate the risk-return characteristics of the annual returns on alternative assets/portfolios into risk-return characteristics of the replacement rates of money purchase plans invested in the corresponding assets/portfolios. This information is essential if participants in money purchase plans, including RRSPs, are to make fully informed investment decisions.

   A useful extension of the present study would be to include stochastic simulations for alternative efficient portfolios (i.e., portfolios which have the maximum expected real return for a given level of risk, or the minimum risk for a given expected real return). This point notwithstanding, the minimum variance portfolio would be the bills-only portfolio, while the portfolio with the highest expected return would be the stocks-only portfolio.

3. For long contribution periods or investment horizons, the attractiveness of common stocks as an investment vehicle merits note. By contrast, Treasury Bills, especially once the serial correlation in bill returns is acknowledged, appear less attractive. This latter point assumes increased importance when it is recognized that Treasury Bills are likely to dominate (higher expected return with the same variance) deposits at financial intermediaries, and that such deposits are widely held in RRSPs.

4. For a given contribution rate (i.e., contribution as a percentage of salary), the income replacement rate under a money purchase plan will fall as the age-earnings profile becomes steeper. The income replacement rate will fall, other things being equal, as the interest rate used in the annuity calculation increases. This result is likely to reflect different, and implicit, degrees of erosion of the nominal pension benefit by inflation. This result merits more attention than it is customarily given.

5. The fact that members of money purchase plans bear substantial investment risk, as evidenced by the uncertainty regarding income replacement rates, must be placed in perspective. In particular, the risks to which members of defined benefit plans are exposed, the extent to which investment risk is actually transferred to the employer/shareholders in defined benefit plans

and so forth merit closer study. It should be acknowledged, however, that proponents of money purchase plans may devote too little attention to the issue of investment risk.

Money Purchase versus Defined Benefit Plans and the Role for Public Policy

Does the fact that members of money purchase plans may be exposed to substantial investment risk suggest that money purchase plans should not be encouraged as a matter of public policy? To answer this question, one must look at the risks to which the member of a defined benefit plan is exposed. There are at least three issues to be examined. First, to what extent are members of defined benefit plans subject to the principal source of risk in today's economic climate, which is inflation risk? Second, to the extent that investment risk per se is borne by employers/shareholders in defined benefit plans, what wage differentials compensate employers/shareholders for assuming this risk? Third, to what extent do members of defined benefit plans actually assume investment risk? To the extent, for example, that members of defined benefit plans receive ad hoc cost-of-living adjustments linked ultimately to the performance of the pension fund, the plan members clearly bear, at least in part, the investment risk. The distinction between defined benefit and money purchase plans thus becomes blurred, and the argument that defined benefit plans ought to be encouraged because they represent the market solution to optimal pension arrangements is clearly weakened. These three issues are analyzed in turn.

The exposure of members of defined benefit plans to inflation risk. Note first that if the defined benefit is nominal (i.e., not indexed), then the plan member is obviously exposed to inflation risk. Formally, the accrued benefit of the plan member is analytically equivalent to a long-term bond. To the extent that investment risk and inflation risk are virtually synonymous for fixed-income securities, the plan member -- through the investment characteristics of his accrued benefit -- is very exposed to investment risk. (The plan member, it should be noted, may be able to hedge his exposure to inflation risk if, say, he has a home with a large outstanding mortgage. For purposes of analysis, however, it will be assumed that the exposure of the plan member to inflation risk is undesirable from the viewpoint of the plan member.) The exposure to inflation risk is readily apparent when the defined benefit is nominal, and this point is raised again later in the discussion. What is less apparent, however, is the fact that the member of a defined benefit plan which provides a fully indexed benefit at retirement is still subject to a high degree of inflation risk. This more subtle case is treated at length below.

Consider an extreme final earnings plan in which the benefit is based solely on the worker's salary in his final year of employment and is fully indexed after the worker retires. An analyst might value this plan, for example, by using a 2.5% interest rate assumption and by assuming that the worker's real salary grows exogenously at 2% per year. Obviously, as the example is constructed, the plan member is not exposed to inflation risk. In this regard, however, the example is quite misleading in its presumption that the worker's salary can be treated as exogenous. Although this assumption may well be appropriate for a defined contribution plan in which any increase in salary does not increase the value of past service credits, it is not likely to be valid for a defined benefit plan if labour markets are competitive.

In a competitive labour market, a worker receives total compensation in every period exactly equal to the value of his marginal product (i.e., the value to the firm of his labour services). Total compensation equals the current wage plus the change in the accrued value of the worker's pension benefits. Assume that a worker is a member of the defined benefit plan described above and that inflation of 10% took place in the previous year. An increase in the worker's current wage has two distinct effects: first, it represents an increase in the current wage component of the compensation package and second, it enhances the value of all past service credits. For a worker with significant past service credits, the latter effect is potentially quite large. The competitive labour market ensures that the worker receives only the value of his marginal product. The fact that an increase in the current wage rate also increases the value of all past service credits is thus factored into the calculation of the competitively determined increase in the wage rate. In the example at hand, there is no reason to expect that in a competitive labour market the employer/shareholders will gratuitously make up the erosion by the 10% inflation of the real value of past service credits. Until the worker actually reaches retirement age, his accrued benefits remain nominal and thus have the investment characteristics of a long-term bond. The worker thus remains highly exposed to inflation risk. If unanticipated[16] inflation erodes the real value of past service credits, then there will be an unanticipated reduction in the worker's current wage to compensate the employer/shareholders for upgrading, at least in part, the erosion of these accrued pension benefits. Clearly, if there is uncertainty regarding the rate of inflation, the treatment of the salary scale as exogenous in the original illustration is clearly inappropriate. The contrast with a money purchase plan, in which the current increase in salary leaves the value of past service credits unchanged, merits emphasis.

---

[16] If the inflation had been anticipated, it would have been appropriately discounted by both the worker and the firm in setting the worker's compensation in the previous period.

The point of the above illustration can be summarized as follows. Even in a defined benefit plan in which the benefit is based on earnings in the worker's very last year of employment, and the benefit is fully indexed after the worker retires, the worker is still exposed to inflation risk. This result occurs because the accrued benefit, until the worker actually retires, is nominal and thus exposes the worker to substantial inflation risk. If inflation erodes the real value of past service credits, then the worker must compensate the firm for updating the value of these credits. Although there may be some debate among economists about the extent to which the existence of implicit contracts between workers and firms might qualify the above analysis, there is at least one fact that offers considerable support for its basic insight. That is the paradox that firms in the private sector are willing to provide final earnings plans, which index benefits during the preretirement period, yet are unwilling to index benefits in the postretirement period. This paradox is easily resolved in the context of the preceding analysis when it is recognized that the firm can extract current wage concessions in the preretirement, but not in the postretirement, period for enrichments to the value of previously accrued benefits.

As noted at the beginning of Part II, the pensions provided by defined benefit plans in the private sector typically are not indexed. As a result, the worker's accrued benefit has the investment characteristics of a long-term bond. An unanticipated increase in the inflation rate, if viewed as permanent, will severely depress the market value of the pension benefit exactly as it would depress the price of a long-term bond. Note that if a member of a money purchase plan chose to hold only Treasury Bills, his exposure to inflation risk (via its impact on real bill returns) would be far less than that of the member of the defined benefit plan. This point applies as well to the terminated vested member of a defined benefit plan, whose deferred nominal annuity has the same exposure to inflation risk as a very long-term bond.[17] Indeed, its duration may well exceed that of a consol (i.e., a bond which pays a fixed coupon for perpetuity), so that the percentage change in the value of the worker's accrued benefit may exceed the percentage change in the relevant interest rate.

To sum up, because most defined benefit plans do not provide indexed benefits to terminated (vested) or retired workers, plan members are exposed to substantial inflation risk. Since inflation risk is the prime source of investment risk for fixed-income securities, the implication is that members of defined benefit plans bear risks similar to those borne by members of money purchase plans. Indeed, to the extent that a member of a money purchase plan chooses to hold short-term debt in his portfolio to limit his investment risk, his exposure to inflation risk will be less than that of the member of the defined benefit plan, whose accrued benefits have the investment characteristics of a long-term bond. Finally, when the case of a defined benefit plan which provides a fully indexed benefit at retirement is considered in detail, it is clear that the worker is still exposed to substantial inflation risk. This result is due to the fact that at any date prior to retirement, his past service credits still represent a purely nominal pension benefit.

The transfer of investment risk to employers/shareholders in defined benefit plans and the role of compensating wage differentials. The principle to be illustrated here can be stated as follows: to the extent that investment risk in a defined benefit plan is transferred from the worker to the firm, shareholders must be compensated for accepting this risk. This simple point, which is discussed below, must be acknowledged in any comparison of defined benefit with money purchase plans.

The point can best be illustrated by reconsidering the case of a benefit that is fully indexed at the time of the worker's retirement. Formal economic analysis indicates that if this benefit is payable with certainty, it must be valued at the risk-free real rate of interest. Assume, for simplicity, that bills yield a real return of 1% with certainty. Suppose that the sponsor of the defined benefit plan chose to hold a risky pension portfolio, perhaps akin to Fund One (see Table 5). The expected real return on this portfolio (not shown in Table 5) is 3.97%. The annuity promised by the plan will be valued by workers at the 1% rate, not the 3.97% rate. This is because the interest rate at which workers could purchase fully indexed annuities in the capital market would be only 1%. The difference between the expected real return on the fund and the certain return on the Treasury Bills (equal to 3.97% - 1% = 2.97%) is the compensation that shareholders receive for assuming the investment risk. If an observer were to argue that workers, in terms of the implicit return on wages foregone to acquire pension benefits, earned 3.97% in the above example, he would clearly be overstating the value to workers of their membership in the defined benefit plan.

---

[17] Again, to the extent that inflation has been anticipated, the anticipated erosion of the real value of the deferred annuity will have already been reflected in past compensation awards. It is only unanticipated inflation which is appropriately identified with the inflation risk to which the deferred annuitant is exposed.

If no risk-free asset exists, the analysis is only slightly more complicated. Assume that workers are risk averse but that employers/shareholders are risk neutral. If workers wanted fully indexed pensions, they would value these benefits at their certainty equivalent of the risk-free real rate. The difference between the expected return on the pension portfolio and this certainty equivalent rate is in effect the insurance premium paid by workers to relieve them of all investment risk. As a result, however, they earn a very low (and possibly negative) real return on the wages foregone to acquire their pension benefits. Equivalently, because of the very low interest rate used to discount the stream of real pension payments, the concession in current wages that workers must make in order to acquire their pension benefits must be quite large.

In short, employers/shareholders must be compensated for assuming investment risk -- to the extent that they do assume investment risk -- in defined benefit plans. Although the fact that employers/shareholders may be better suited to assuming investment risk than workers merits notice and may ultimately provide a rationale (at least in a noninflationary environment) for defined benefit plans, the role of compensating wage differentials as discussed is noteworthy. To ignore the role of compensating wage differentials is, in a very superficial way, to overstate the value to workers of participating in defined benefit plans.

Ad hoc cost-of-living adjustments financed from excess investment earnings: are defined benefit plans just money purchase plans in disguise? In spite of the fact that the pensions provided by most defined benefit plans in the private sector are not contractually indexed, many employers have made substantial ad hoc payments to limit the eroding impact of inflation on pensions in pay. There are no very long-term bond.[17] Indeed, its duration may well exceed that of a consol (i.e., a bond which pays a fixed coupon for perpetuity), so that the percentage change in the value of the worker's accrued benefit may exceed the percentage change in the relevant interest rate.

To sum up, because most defined benefit plans do not provide indexed benefits to terminated (vested) or retired workers, plan members are exposed to substantial inflation risk. Since inflation risk is the prime source of investment risk for fixed-income securities, the implication is that members of defined benefit plans bear risks similar to those borne by members of money purchase plans. Indeed, to the extent that a member of a money purchase plan chooses to hold short-term debt in his portfolio to limit his investment risk, his exposure to inflation risk will be less than that of the member of the defined benefit plan, whose accrued benefits have the investment characteristics of a long-term bond. Finally, when the case of a defined benefit plan which provides a fully indexed benefit at retirement is considered in detail, it is clear that the worker is still exposed to substantial inflation risk. This result is due to the fact that at any date prior to retirement, his past service credits still represent a purely nominal pension benefit.

The transfer of investment risk to employers/shareholders in defined benefit plans and the role of compensating wage differentials. The principle to be illustrated here can be stated as follows: to the extent that investment risk in a defined benefit plan is transferred from the worker to the firm, shareholders must be compensated for accepting this risk. This simple point, which is discussed below, must be acknowledged in any comparison of defined benefit with money purchase plans.

The point can best be illustrated by reconsidering the case of a benefit that is fully indexed at the time of the worker's retirement. Formal economic analysis indicates that if this benefit is payable with certainty, it must be valued at the risk-free real rate of interest. Assume, for simplicity, that bills yield a real return of 1% with certainty. Suppose that the sponsor of the defined benefit plan chose to hold a risky pension portfolio, perhaps akin to Fund One (see Table 5). The expected real return on this portfolio (not shown in Table 5) is 3.97%. The annuity promised by the plan will be valued by workers at the 1% rate, not the 3.97% rate. This is because the interest rate at which workers could purchase fully indexed annuities in the capital market would be only 1%. The difference between the expected real return on the fund and the certain return on the Treasury Bills (equal to 3.97% - 1% = 2.97%) is the compensation that shareholders receive for assuming the investment risk. If an observer were to argue that workers, in terms of the implicit return on wages foregone to acquire pension benefits, earned 3.97% in the above example, he would clearly be overstating the value to workers of their membership in the defined benefit plan.

---

[17] Again, to the extent that inflation has been anticipated, the anticipated erosion of the real value of the deferred annuity will have already been reflected in past compensation awards. It is only unanticipated inflation which is appropriately identified with the inflation risk to which the deferred annuitant is exposed.

If no risk-free asset exists, the analysis is only slightly more complicated. Assume that workers are risk averse but that employers/shareholders are risk neutral. If workers wanted fully indexed pensions, they would value these benefits at their certainty equivalent of the risk-free real rate. The difference between the expected return on the pension portfolio and this certainty equivalent rate is in effect the insurance premium paid by workers to relieve them of all investment risk. As a result, however, they earn a very low (and possibly negative) real return on the wages foregone to acquire their pension benefits. Equivalently, because of the very low interest rate used to discount the stream of real pension payments, the concession in current wages that workers must make in order to acquire their pension benefits must be quite large.

In short, employers/shareholders must be compensated for assuming investment risk -- to the extent that they do assume investment risk -- in defined benefit plans. Although the fact that employers/shareholders may be better suited to assuming investment risk than workers merits notice and may ultimately provide a rationale (at least in a noninflationary environment) for defined benefit plans, the role of compensating wage differentials as discussed is noteworthy. To ignore the role of compensating wage differentials is, in a very superficial way, to overstate the value to workers of participating in defined benefit plans.

Ad hoc cost-of-living adjustments financed from excess investment earnings: are defined benefit plans just money purchase plans in disguise? In spite of the fact that the pensions provided by most defined benefit plans in the private sector are not contractually indexed, many employers have made substantial ad hoc payments to limit the eroding impact of inflation on pensions in pay. There are no official data compiled by the Government of Canada on either the magnitude or frequency of these adjustments. Two private surveys, however, provide evidence on this issue. The Tomenson-Alexander survey notes that 117 of the 149 large (active membership of at least 500) plans surveyed provided some form of cost-of-living adjustments to pensions in pay during the period 1971-1975.[18] For the majority (101 respondents), the adjustments were not required under the terms of the plan and thus were entirely ad hoc. For those plans reporting adjustments, the payments averaged two-thirds of the amount necessary to offset fully the impact of inflation as measured by the consumer price index. The recent Financial Executives Institute Canada (FEIC) study indicates that 75% of the respondents had taken some action to offset the impact of inflation. Again, in the great majority of cases, this action was taken unilaterally by the plan sponsor.[19]

Of equal importance, there is evidence that a significant proportion of these payments are being financed out of excess investment earnings, or investment earnings in excess of the assumed valuation rate. The FEIC reports that 59.5% (by plan respondent) of the cost increases were funded out of plan assets, while 31.8% were "expensed as paid."[20] It would appear that "expensed as paid" refers to payments out of general corporate revenues, although this is not clear from the questionnaire. In the Tomenson-Alexander survey, the ad hoc adjustments were financed, in whole or in part, through general corporate revenues for only 32 of the 117 firms which made these adjustments. The majority of firms thus financed the ad hoc payments by creating new unfunded liabilities which were discharged through a combination of plan surpluses and special payments. In general, the likelihood that many firms are using excess investment earnings to finance ad hoc cost-of-living adjustments and/or nominal benefit enrichments (career average plan) is widely acknowledged within the private pension industry. At the National Pensions Conference held 31 March to 2 April, 1981 in Ottawa, discussions of ways to improve the cost-of-living protection afforded pension benefits focused on the use of excess investment earnings. The apparent support among employers' delegates for this principle provides de facto evidence that this is already a widespread practice.

---

[18] Tomenson-Alexander Associates Ltd., Report on Certain Aspects of the Public Service Employee Pension Program (Ottawa: Treasury Board, 1978), p. 131.

[19] FEIC, Report on Survey of Pension Plans in Canada (Toronto: Financial Executives Institute Canada, March 1980), p. 40.

[20] Ibid., p. 41.

To the extent that ad hoc cost-of-living adjustments are linked, at all or in part, to the performance of the pension funds, workers in fact bear the brunt of investment risk in these defined benefit plans.[21] This point has two important implications. First, and perhaps as a response to increased inflation uncertainty, defined benefit plans have taken on the fundamental characteristic of money purchase plans. Second, the argument that the defined benefit plans represent the market solution to private pension arrangements loses much of its force. Indeed to the extent that there are legal or institutional (for example, the existence of large unfunded liabilities) impediments to the termination of defined benefit plans and their replacement by money purchase plans, the metamorphosis of defined benefit plans described above may be interpreted as implying that money purchase plans are now the market's preferred solution.

Implications for Public Policy

The major policy implications of this study are reviewed briefly below.

1. Participants in money purchase plans, including RRSPs, bear all of the investment risk associated with saving and accumulating capital for retirement. They should be informed of the uncertainty regarding the income that would ultimately be replaced through a money purchase plan with a fixed contribution rate, together with the relationship between this uncertainty and the risk-return characteristics of alternative assets. To advocate the expansion of money purchase plans without an explicit assessment of this issue would be irresponsible.

---

[21] Because benefits which are enriched in nominal terms tend not to be reduced (in nominal terms), the sponsor in fact places a succession of nominal floors on the pension benefit. If investment earnings are below the assumed valuation rate, the plan sponsor makes up the shortfall. In this sense, the plan sponsor and the worker share the investment risk. Formally, the worker has a nominal benefit that is guaranteed by the plan sponsor and a call option on investment earnings with a striking price equal to the valuation interest rate.

2. The fact that members of money purchase plans bear all of the investment risk does not constitute a de facto argument in favour of defined benefit plans. Even if the pension provided by a defined benefit plan is fully indexed at retirement, the plan member's accrued benefit is equivalent to a long-term bond, and the plan member is thus exposed to considerable inflation risk. In the more realistic case where the benefit is not indexed, the accrued benefit remains nominal -- and thus retains the investment characteristics of a long-term bond -- after the plan member retires. Because their (nominal) accrued benefits are so vulnerable to inflation risk, members of defined benefit plans are clearly more subject to the risks posed by unanticipated changes in the rate of inflation than are members of money purchase plans if the latter choose to hold less risky (than long-term bonds) assets such as, say, shorter term fixed income securities.

   In certain instances, firms that sponsor defined benefit plans may assume a significant amount of investment risk. This is perhaps most apparent if the benefit is fully indexed at retirement. What merits emphasis in this case, however, is that the firm's shareholders must be compensated for accepting this risk. If the benefit is fully indexed, for example, then it must be valued for purposes of current versus deferred wage trade-offs at the risk-free real rate of interest.[22] Any expected return on the pension fund's assets in excess of this rate (which is clearly less than the 1% expected real return on Treasury Bills) represents compensation to the shareholders for assuming the attendant investment risk. Without due consideration of the fact that shareholders must be compensated if, in fact, investment risk is transferred to them, the advantage to plan members of any reduction in risk that occurs by virtue of their participation in a defined benefit plan is easily overstated.

3. The most crucial evidence regarding the market's acceptance of the money purchase concept is the apparent metamorphosis of many defined benefit plans into defined benefit/money purchase hybrids. There is substantial

---

[22] This assumes that the indexed benefit is payable with certainty. Note that the result obtains regardless of the interest rate used by the firm to value the benefits payable under the terms of the plan. The valuation assumption, in this instance, is appropriately regarded as an accounting veil.

evidence that many (and perhaps most) sponsors of defined benefit plans have been making ad hoc cost-of-living adjustments to pensions in pay if investment earnings exceed the assumed valuation rate and the plan thus experiences an actuarial surplus. In short, workers, not the employer/shareholders, assume most of the investment risk on the plan's funds. For those plan sponsors who make no such adjustments, members are of course exposed to substantial inflation risk. The metamorphosis of defined benefit plans as described above nullifies to a large extent the argument that they represent the market's preferred solution to the optional pension arrangement. Although a detailed assessment of why defined benefit plans were introduced on such a large scale lies beyond the scope of the present report, it would appear that any explanation that focuses on the transfer of investment risk from plan members to shareholders does not withstand close scrutiny.[23]

4. Even if a universal money purchase plan (such as PURS) is not mandated into existence, money purchase plans will likely play an increasingly important role in Canada's retirement income system. Not only do RRSPs continue to grow, but the likelihood is that a locked-in RRSP will play a major role in reforms designed to increase the effective portability of pension benefits. In view of this fact, the following are of continued importance.

    (a) Participants in money purchase plans must be made aware of the risk-return characteristics of alternative assets, especially as they pertain to the income replacement objective of retirement planning. Stochastic simulations of the type performed in this study should be of particular value in this regard. The role for public policy is to encourage the dissemination of this information.

    (b) During a plan member's work years, he may have the flexibility to vary his contribution rate -- by altering his work-leisure and/or consumption-savings behaviour -- as a means of enhancing his ability to assume investment risk. This fact, together with the relatively long investment horizon, increases the likelihood that a well-informed plan member might choose a risky portfolio during his active work years and a less risky portfolio, such as a variable annuity tied to a bills-only portfolio, in his retirement years. This possibility, together with the prospects for a new annuity design in an inflationary climate, merits continued attention.

---

[23] In addition to any incentive-oriented dimensions of defined benefit plans, one might speculate that their original appeal stems, at least in part, from the fact that the more rapid accrual of benefits as the worker ages mirrors the worker's desire to receive a large fraction of his total compensation in this tax-sheltered form as he ages and thus approaches retirement.

(c) Particularly when explicit consideration is given to the fact that their returns are likely to be serially correlated, relatively safe assets such as Treasury Bills, as well as the fixed-term deposits at financial intermediaries which they dominate, may not prove to be an attractive asset for individuals with a long investment horizon. This possibility, and the broader issue of informing plan members of risk return trade-offs in the context of the income replacement objective of retirement planning, merit increased attention.